JANUARY 13, 1958 PRICE 50 CENTS

R&D Research and Development edition

Product Engineering

McGRAW-HILL MAGAZINE OF DESIGN
RESEARCH AND DEVELOPMENT

FIBERGLASS SPRAYED ON...

see page 17

motivation research—

WHAT'S IN IT FOR YOU?.. see page 38

UNIVERSITY MICROFILMS INC
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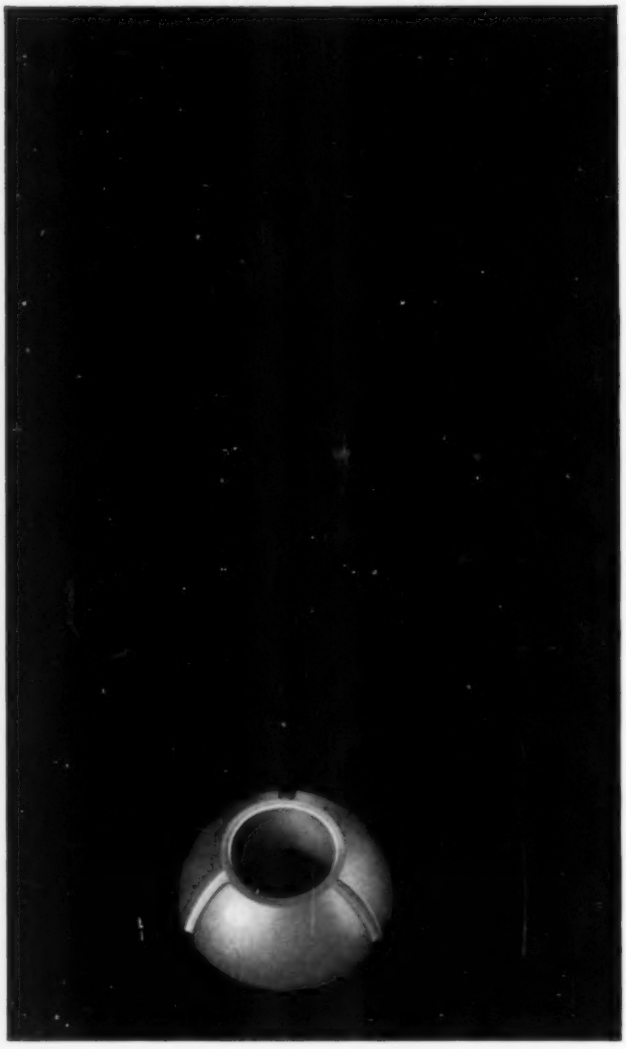
ANN ARBOR MICH A



Spherical bearings for
a ball joint suspension assembly
shown actual size.

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Division of General Motors, Dayton, Ohio

WHAT DO YOU WANT in the R AND D EDITION

What's Happening in Science
and
What's Happening in Materials

Our science column is "blue-sky," but not ivory tower—the laboratory developments-to-watch. On this page you find the significant discoveries, the exciting trends that promise to revolutionize the products of tomorrow. Gravity control, cryogenics, atomic particles and radiation have been in the news these past few issues. Look for a clarification of high-energy fuels, a new method for super-high-speed photography and some Russian ideas on science coming soon.

The materials page analyzes latest developments in metals, plastics, oils and even paper, tabulates price and availability changes and shows how old materials as well as new ones are put to work.

This is a product planned for product planners. Like any other product it will be improved as new materials, processes and ideas are introduced. Let us have your comments and criticisms—they are our most fertile source of new ideas.

coming next week . . .

the DESIGN edition for January 20

FEATURING:

- **Gray iron castings.**
  A special report updating available hi-temperature data.

- **Punched cards—an answer to wiring woe.**
  Black-box components teamed with a punched-card system can save time and grief.

- **Which coating at high temperature?**
  Types best for corrosion resistance, erosion resistance, compatibility with base materials.

- **Ratchet layout analyzed.**
  Formulas and data for precise ratchet design.

- **6 Spring-loaded chucks and holding fixtures.**
  Based on material supplied from German sources.

- **Selection guide for sandwich panel core materials.**
  Structural-composite panels are aimed at various design needs, and it's the filler that's important.

- **How to design multi-rate helical springs.**
  Two little-known methods to assemble springs in series to give a varying spring rate.

Product Engineering

McGRAW-HILL MAGAZINE OF DESIGN, RESEARCH AND DEVELOPMENT

R&D Research and Development edition

January 13, 1958 Vol. 29, No. 2

FEATURED:

DEPARTMENTS

SIDELIGHTS 2
LETTERS 4
HORIZONS 15
SIGNIFICANT PARTS 40
NEW LITERATURE 49
MEETINGS 50
PUBLISHER'S POSTSCRIPT 52
FYI PERSONAL 53
WHY NOT R & D? 54

NOW—SPRAYED REINFORCED PLASTICS challenge hand lay-up methods of making glass-reinforced products 17

SHOULD YOU USE OUTSIDE INVENTORS? Don't solicit ideas, and set up a carefully controlled system for those that are offered 29

POINTS OF VIEW. Who owns the results of basic research underwritten at a university? 32

TRENDS IN APPEARANCE DESIGN. Seats for mobile equipment designed for minimum fatigue 36

MOTIVATION RESEARCH—WHAT'S IN IT FOR YOU? Is it a passing fad or a valuable technique to guide product design? 38

FIELDS OF INTEREST:

MATERIALS:

Two new synthetic fibers from overseas 8
Materials progress expected in 1958 11
Plastic coatings for color, cushioning and corrosion protection 11
Lighter-gage stainless promised in greater widths 5
Molybdenum gets 2300 F coating 21

PROCESSES:

Optical caliper for hot rod and strip 8
Transformer sheeting is cold-rolled 8
What the oxygen process means to steel 11

TEST:

Souped-up energy at work—meet the maser 10
Test chamber for air-conditioning equipment 6
Rocket-powered fire extinguisher for use at arctic temperatures 5

DESIGN:

X-ray pictures with sound waves 10
Toothed tires for snow and soft ground 8
Flexible automation tailored to industry needs 20
Overrunning clutch has 39 ruby bearings 6
Chemical camera shutter has no moving parts 5

GOVERNMENT:

Washington will bear close watching this year 7
Science main topic at Institute of World Affairs 21

PERSONNEL:

Government scientists needed badly 24
Computer industry draws feminine mathematicians 20

Product Engineering ..... SIDELIGHTS

R&D Research and Development EDITION

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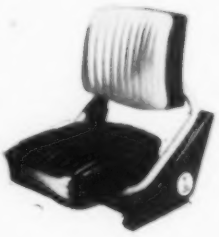

● **Seats had always been designed** for what was considered a relatively insensitive part of the human anatomy. Now we have scientific proof for what any red-blooded kid always knew—that only areas near the "ischial tuberosities" (those two bony bumps buried in the buttocks) are relatively free from nerve endings and blood vessels (p. 36). The rest of the region responds quite naturally to a bouncing ride or father's belt.

● **Not too long ago inventors** were poverty-stricken but highly romantic figures. Their lives were dramatic, dangerous and, reasonably often, followed by a pot-of-gold patent at rainbow's end (p. 29). Today research is different and rather dull. Says Thurman Arnold, "Each man is given a section of the hay to search. The man who finds the needle shows no more 'genius' than the others. . ."

● **All this motivation research talk** (p. 38) has some pretty frightening implications. It was bad enough when the marketing specialists went about "creating a demand" for some nonsensical product—now they're thinking up ways to make us buy things we actively dislike! But people are not as gullible as Madison Ave. seems to think. To counter singing commercials, we developed a kind of selective deafness. To counter motivation research we may be forced to come to an understanding with our own subconscious—and the man who truly understands himself may be a very poor customer for trash.

● **A deep, heavily accented voice** sounded through a staff editor's phone a short while ago saying, "This is Ilya Tolstoy. I am at the Explorer's Club and someone here recommended I call you with my problem." This was no gag—seems he's training porpoises and what would we recommend as a plastic leash material? It should be strong (dolphins are powerful swimmers), reasonably flexible, indifferent to salt, and practically invisible under water. The idea was to take movies of the porpoise as it was steered by skin divers through the colorful deeps. Sounds like fun.

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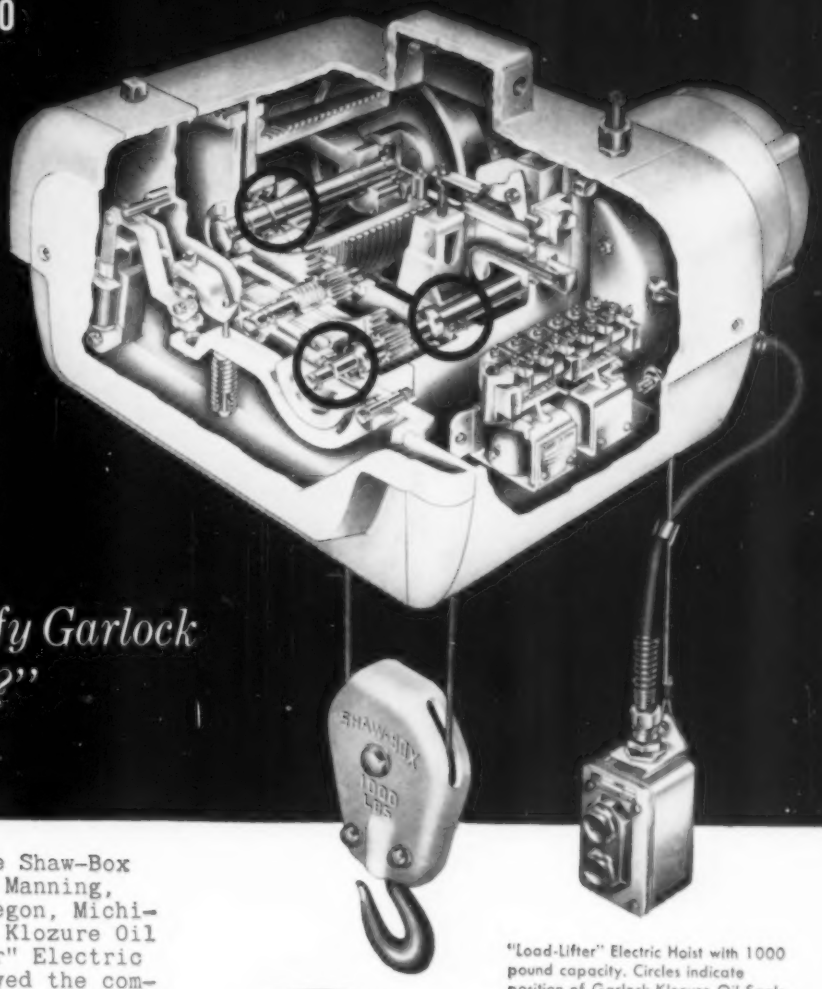
MORE OF THE GARLOCK 2,000

We Asked MANNING, MAXWELL & MOORE:

"Why do you specify Garlock Klozure Oil Seals?"*



"Load-Lifter" Electric Hoist with 1000 pound capacity. Circles indicate position of Garlock Klozure Oil Seals.

For the past five years, the Shaw-Box Crane and Hoist Division of Manning, Maxwell & Moore, Inc., Muskegon, Michigan, have specified Garlock Klozure Oil Seals for their "Load-Lifter" Electric Hoists. Recently, we surveyed the company to find what benefits they received by specifying Garlock.

Here is their reply:

"We use Klozure Oil Seals for three primary reasons.

1. dependability. Our hoist is designed for heavy duty use. A failure in any oil seal would shortly render the hoist inoperable. Therefore, we must use oil seals consistent with the quality built into the entire hoist.
2. long-life. The oil seal must permit easy maintenance and be reusable after hoist repair since replacement of oil seals during a minor overhaul is undesirable.
3. standardization. The fact that Garlock can meet nearly every oil seal requirement permits us to attain greater standardization of hoist components."

Cross section of Model 51 Garlock Klozure Oil Seal designed for medium-speed rotary service and low pressure reciprocating service. Two of these seals are used on the motor pinion shaft and a specially designed Klozure Oil Seal on the rope drum of the Electric Hoist illustrated above.

Garlock Klozure Oil Seals can serve your company equally well. Ask your Garlock representative for his recommendation from "the Garlock 2,000" . . . two thousand different styles of packings, gaskets and seals for every need. Or write for Klozure Catalog 20.

THE GARLOCK PACKING COMPANY, Palmyra, N.Y.

For prompt service, contact one of our 30 sales offices and warehouses throughout the U.S. and Canada.

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Molded and Extruded Rubber, Plastic Products

READER TO EDITOR

Don't Classify the Engineer

To the Editor:

There has been a lot of talk lately regarding "Shortage of Engineers." Maybe there is a shortage. However, some may say, from their average salary, that there isn't.

What is meant by "Shortage of Engineers"? Just what type of vocation, or class of engineers, are you referring to? By what standards do you classify engineers? I believe that it is time for some organization to classify the type of work performed, and the ability requirement of the technician to carry out the particular phase in the field of operations. I am of the belief that management also should be aware, to recognize the normal basic function in engineering work procedure.

It is my opinion, that when "engineers" are classified, you may find very few real engineers in any field. Also I believe there are many engineers of potential ability to fit into real engineering work, who find themself denied the perspective to express their real potential.

—Louis Supin
Brooklyn, N. Y.

An Old Problem

To the Editor:

May I comment from personal experience on two aspects of the controversy regarding utilization of engineers?

In your comment on Dr. Beck's article (Oct. 7, p. 30), you stated that it was very hard to put across a new product. I have found this to be true. Working for a large company, I repeatedly submitted ideas which were never considered—there is a mechanism for consideration of an idea submitted by an hourly worker, but a highly paid engineer just can't get an idea in, unless it is on a personal basis. On my last submitted idea, I was told that the idea was not practicable and not suitable for patenting. Yet, now that I am no longer with the company, they won't release my idea back to me, even though they won't use it. So now what happens? The idea dies, and we all suffer, assuming that it's a good idea.

When my previous job was terminated, due to a reduction in the engineer "stockpile," I found the following to be true:

(a) A P.E. license isn't worth a nickel unless used for a job where it is specifically required.

(b) Most companies aren't clamoring for engineers—they're looking for very narrow specialists. Consider this: I have a P.E. license—I have had seven published articles in a nationally known power-field magazine—I have 15 years' experience, mostly practical, in the power field—I sent out about 60 resumes in looking for a new job. I received about 60 letters congratulating me on my fine background and experience.

Did I get any really enthusiastic response? Outside of the nice letters, I only received invitations for two interviews. Fortunately, one of them turned out to be a good job, where I can use what I know.

In several instances, in the case of utility and oil companies, I was told that the policy was to "promote from within." Where do such companies get new blood and new ideas? Actually, if such a policy were more widespread, the effect would be to freeze all engineers with one company.

Engineering shortage? Nuts!

—Name withheld

The Typical Engineer

To the Editor:

I have been following with interest your discussion of "What is an Engineer?" A close examination of the enclosed photo clipped from an ad for forgings will no doubt add to your data. How misunderstood can you get?

—Fred T. Chandler
Kearfott Co., Inc.
Clifton, N. J.

• Mr. Chandler's photo shows a well-groomed Madison Ave. model in a spotless blue suit. His creases are razor sharp and his brown shoes reflect the gleam from his white shirt. He's studying a slide rule while dangling a micrometer from the little finger of his left hand. Further props include eight books, blueprints, triangle, some forgings and a new draftsman's stool. The only thing lacking is a pipe and a bearskin rug. If his mind could be read it would say, "Lets put this idea on a train and see if it gets off at Westport."—*Ed.*

Simplified Drafting

To the Editor:

In your Nov. 18 issue (p. 42) you asked, Have Simplified Drafting Procedures Saved You Money? In the absence of any agreed definition of Simplified Drawing Practices, these must be construed to encompass those drawing practices which establish the most direct and unequivocal identification of the practices to be employed efficiently to prepare drawings.

As is well known, the Department of Defense has developed over the past number of years a great body of standards for drafting practices. The requirements contained in these standards are designed to be applicable and understood without ambiguity by every segment of the economy doing business within the Department of Defense. In many respects these requirements contain shortcuts beyond those adopted generally by industry; for example, the use of standard symbols for geometric form, as contained in MIL-STD-8.

Obviously, since these standards must be susceptible to uniform application by all segments of industry, they do not contain some abbreviated practices which may be observed by some isolated elements of industry, which are not elsewhere understood in industry. The military standards for drafting-room practices are normally invoked as an integral part of the contract requiring the preparation of drawings. It is essential that these requirements be susceptible universally to a single interpretation.

The use of military standards in the preparation of drawings has returned untold dividends to the Department of Defense in terms of stability of communication between the military and its contractors, and validity of communication between design and fabricating activities.

—J. J. Dunn
Staff Director for Standardization
Office of Production Policy
Department of Defense

• American Drafting Standards Manual Y-14, discussing Size and Format, Line Conventions, pictorial drawings, and dimensioning has just been published by the ASA.—*Ed.*

American...

DEVELOPMENTS TO WATCH...

A chemical camera shutter . . .

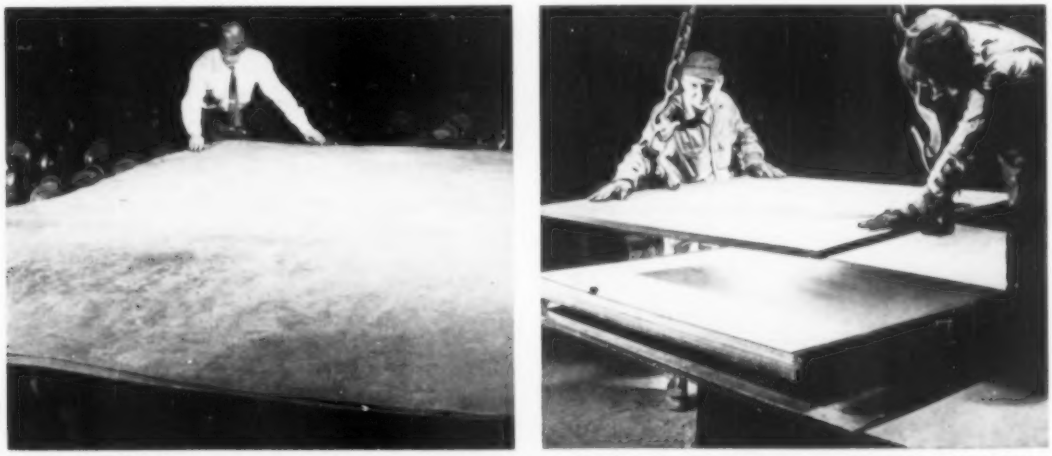
. . . that will permit exposures as short as five billionths of a second is being developed by Electro-Optical Systems, Inc., under Army contract. It is a shutter that has no moving parts; uses, instead, a chemical that can be "pulsed" electronically. In its normal state it's opaque to light, but transparent when subjected to an electrical stimulant. Picatinny Arsenal, which plans to use the camera to study high-speed shock waves and similar phenomena, hopes eventually to develop the unit to a point where pictures can be made with an exposure time of even less than a billionth of a second.

Rocket-powered fire extinguishers . . .

. . . are being developed at Naval Research Laboratory for use at arctic temperatures. There's a good reason for them too. As NRL points out, commercial fire extinguishers that depend on carbon dioxide or air have pressure too low at such temperatures to achieve a satisfactory velocity of expulsion and distance of throw. So, NRL is working with a pressurizing cartridge that uses solid, slow-burning propellant (nitroguanadine type). This, it says, "provides fire extinguishment at −65F equivalent to that provided by conventional extinguishers at room temperature." It looks like a conventional extinguisher, and has another advantage as well: Its midget rocket allows loading more extinguisher fluid into a shell of a given size; and the fact that the propellant burns slowly and continuously makes it possible to hold expulsion rate and throw distance practically constant. (Other new uses for propellants: Jan. 6, p. 56.)

Lighter-gage stainless sheet in larger widths . . .

. . . with less waste is promised by a new rolling technique now under development by U. S. Steel Corp. It's a sandwich method with the stainless billet enclosed in carbon steel (plates top and bottom, bars welded around the sides) then heated and rolled by standard procedures. USS says it can achieve a 90% reduction, turn a ⅛-in. billet into a usable sheet 90 in. wide and 230 in. long. Furthermore, the sandwiches are said to have the working characteristics of the carbon-steel cover plates, so that "no revamping of rolling mills to supply more power or stiffen the rolls has been necessary." USS is now refining the technique and testing its application to high-alloy steel and other metals.



Big sheets of light-gage stainless steel are reproduced by sandwiching the metal between carbon-steel plates. Photos: left, rolled and sheared sandwich, with thin stainless sheet still inside; right, original makeup, being readied for rolling.

American...

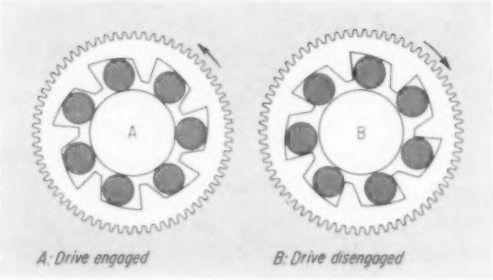
(continued)

DEVELOPMENTS TO WATCH...

Jeweled one-way drive . . .

. . . that converts oscillating motion into unidirectional rotation, without the use of ratchets or springs, will soon be introduced here. The precision unit has 39 ruby bearings, yet is surprisingly simple in design. As might be expected from its homeland–Switzerland–the unit's first application will be in self-winding watches; but its developers believe this Gyrotron movement has many industrial applications.

Heart of the movement is a special "free-wheel clutch mechanism" whose object is to obtain coupling as and when required between two coaxial components: one, a disk secured to an arbor; the other a gear. On the inner surface of the gear are trapezoidal notches; in each is lodged a small ruby roller. Radial depth of each notch increases from one end to the other; when the ruby is in the narowest part of its working space, it is wedged into contact with the disk, coupling it to the gear. On the other hand, when oscillation turns the gear in the opposite direction, the roller moves into the wider parts of the notch, freeing the disk. The diagram shows position of the rollers in the engaged and disengaged condition. No lubrication is required for either the clutch mechanism or rollers.



A: Drive engaged *B: Drive disengaged*

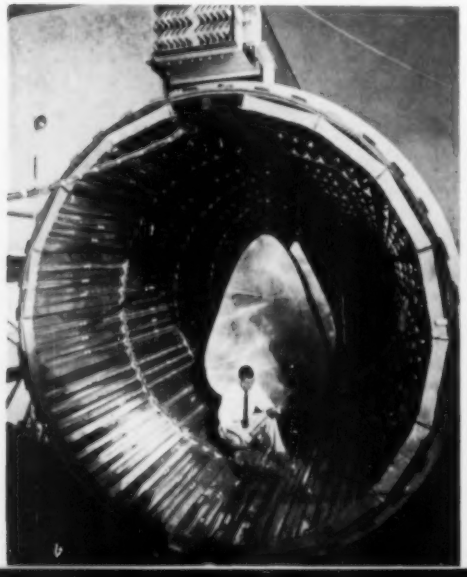
First application is in a self-winding watch–the Girard-Perregaux Gyromatic–to be introduced at an industry meeting later this month. But G-P is sponsoring an inertial study in this country, and is anxious to explore industrial possibilities.

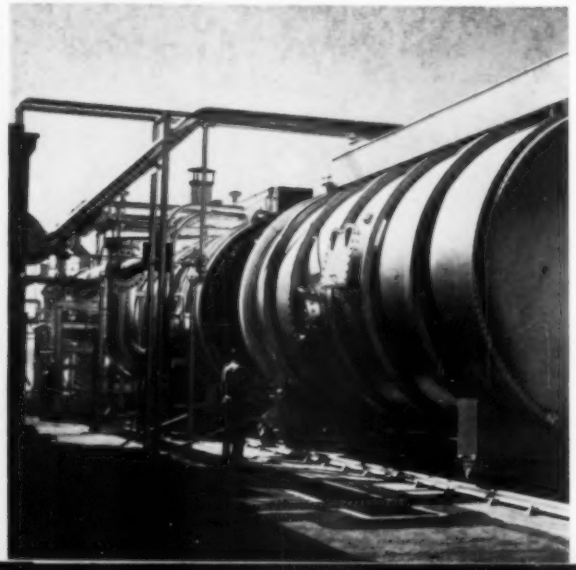
An aircraft industry "first". . .

. . . is the cooling test-chamber pictured below. But it's not likely to stand alone very long. As operating temperatures rise–in computers and other types of equipment, as well as in high-flying aircraft–the need for test equipment of this kind will grow. Already, for instance, big computers generate enough heat to warm a good-sized house, and keeping them cool is becoming a major air-conditioning and refrigeration problem.

This test chamber, built by Convair for testing its F-106A Delta Dart, is equipped with 750 tubular 2500-w infrared quartz lamps (filament temperature, 4000 F); can be sealed and evacuated to simulate high-altitude conditions. –ARG

Cooling test-chamber is designed to put air conditioning equipment through its paces. Photo at left—chamber interior, with its tubular lamps and metal reflectors; at right—how the two chamber sections fit together.





DEVELOPMENTS TO WATCH...

Washington will bear close watching . . .

. . . this year. Congress and the administration must deal with two basic issues, both having significance for business. They are: the boosting of defense programs; and the fighting off of any signs of an economic recession that might crop up.

The Democrats in Congress will be calling the signals more than ever before. Congress is generally unhappy over the way the administration has let the Russians outpace us in missiles. Indications are that it will try to spread its influence beyond the legislative duties, get more into the business of shaping basic policies.

Here are specific areas to watch, with the probable outcome:

Military Spending—will be increased for the year beginning next July. The administration is expected to ask for around a $2-billion increase, but Congress is expected to boost this—perhaps closer to the $4-billion level. And, some forecast that the defense budget will be doubled within the next ten years.

Missile Spending—is expected to jump from its present $2.5-billion level to around $4-billion. Roughly half of this will go for the long range ballistic missiles.

Manned Aircraft Spending—is expected to drop under the $7-billion mark for the first time since 1952. Fighter planes will feel the pinch, with bomber production remaining steady, and may even rise a bit. There will be cuts, too, in such hardware as combat vehicles, support vehicles, artillery, and weapons.

Offsetting Higher Military Spending—will be cuts, or attempts to cut, non-military items such as welfare programs (dams, flood control, health, other similar services). Here is where the administration will make its recommendations for cuts, but there is strong doubt just how much Congress will let be trimmed. For one reason, cuts here won't begin to pay for the increased military spending. And, these are vote getting programs back in congressional districts.

Aid to Scientific Education—including Federal funds for hiking teacher's pay, modernizing equipment and scholarships are sure to be approved. Higher pay for government scientists and engineers seems a sure bet, too.

A Tax Cut is Out—but on the other hand, there is not likely to be a tax increase either. Expiring corporate and excise rates will be extended at present levels, and some tax loopholes that have given "inadvertant benefits" may be plugged. It is possible that some type of anti-recession tax cut for consumers may be voted if unemployment goes much over the five million mark.

Administrative steps may be taken to curb any economic downturn that shapes up. The Federal Reserve Board, now committed to countering a business slide, will be the key agency. It has loosened up on credit some.

Atomic Energy Programs—seem sure to get bigger Federal dollar support to develop commercial-sized atomic power plants. It will come in spite of AEC opposition.

Patent Hearings—are likely. They will be aimed at piece-meal tinkering with the Patent Law. Outlook seems to be to hike the pay of patent examiners.

Saline Water Research—will get more Federal money. Currently the program is running around $725,000 a year. Funds for and water pollution research projects are expected to be continued at about their same level.

Basic Research—programs will be voted more money. There is accord between both the administration and Congress that this area must be boosted. The National Science Foundation, National Institute of Health, and other such agencies will get fatter budgets. They in turn will support research done by universities and individual scientists.

World-wide ... DEVELOPMENTS TO WATCH...

Specify cold-rolled transformer sheeting . . .

. . . vacuum-annealed, to keep power losses down, a German study recommends. Tests made of 4.3 Si-0.25 Al sheet, annealed in a high vacuum, showed cold-rolled metal had appreciably lower losses than hot-rolled metal (0.43 vs 0.48 watts per lb at 10,000 gauss; 1.08 vs 1.23 at 15,000 gauss). Annealing the sheets in a hydrogen or hydrogen-nitrogen atmosphere, gave similiar results but losses were higher. The study also indicated that purity of the metal itself is not as important when sheets are to be annealed in high vacuum as when a protective gas atmosphere is used.

An "optical caliper" for hot rod and strip . . .

. . . is being developed by the British Iron and Steel Research Assn. Measuring the width of a long object like a rod, from the side and at a distance, presents problems. The Association explains the rod would have to be guided so it was always at same distance from the instrument–to prevent distortion by perspective. Hence the experiments with a "telecentric" lens system that "makes the size of the image independent of distance between object and instrument." The lens system might be employed in a number of ways. For instance, viewing a hot rod through a slit from two positions, above and at the side, and projecting the two images side by side on a screen, would show the degree of ovality (length of the illuminated portion of the two images would give diameter of the rod at two positions at right angles, and a difference between them would indicate the rod was oval.)

Other current projects at BISRA: translator control for automatic operation of rolling mills, a "self-lining" blast furnace, and an "electron probe" for microanalysis.

Two new synthetic fibers . . .

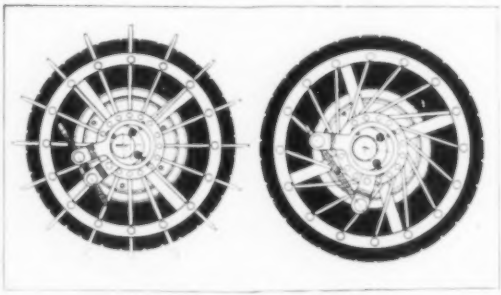
. . . are claimed superior to both natural and other synthetic products, and may have industrial as well as consumer applications.

One is a urea fiber dubbed *Urylon*. The Japanese who developed it say it's strong, elastic, and has unusual water resistance; can be used for tire cord, plastics reinforcement, marine rope, as well as for consumer textile products. Toyo Koatsu Industries, Inc., Tokyo, believes it equals or surpasses nylon and Dacron in many respects; has applied for world-wide patents. Specific gravity of the fiber is given as 1.07; strength (wet or dry), 5 to 5.5 g/denier; Young's modulus, 500 to 600 kg/mm²; melting point, 470 F; elongation 15 to 20%.

Much less information is available on the Polish fiber, but it's an "artificial wool," developed by the Institute of Artificial Fibers and Synthetic Materials at Gorzov (formerly Landsberg, a part of Germany), and is said to be lighter than wool, more resistant to acids, and nonwrinkling. Name: Elena.

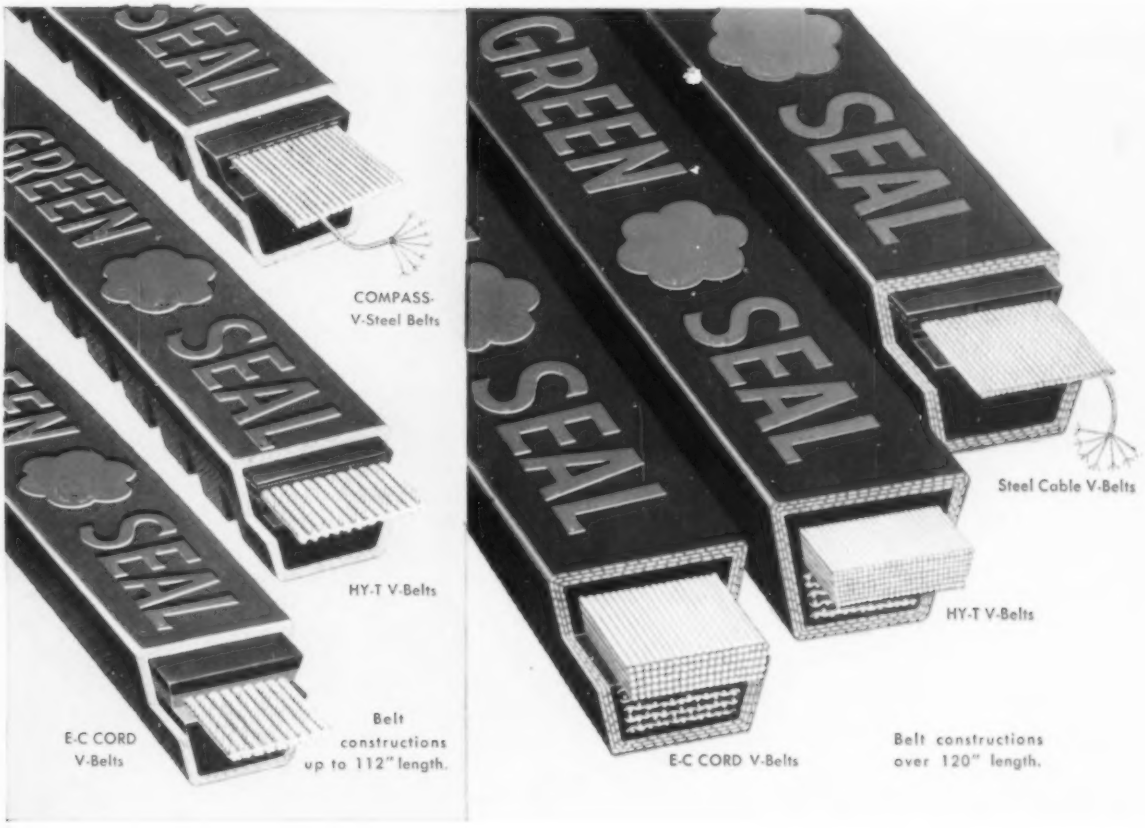
Neither snow, sleet, mud stay these tires . . .

. . . from their appointed rounds, says Italy's Ditta Capra Giglio. They're designed for trucks and tractors that frequently travel over snow and soft ground as well as on paved roads. As the diagrams indicate, the metal teeth can be moved in or out as desired to provide the needed traction. Added advantage; the vehicle can travel for some distance even if the tires are punctured.



Do you know the inside story of

V-Belts with the Green Seal?



Until recently dimensional stability was possible only in V-Belts with steel load-carriers as developed by Goodyear. But now you can have that stability in a complete line of belts – thanks to the development of Triple-Tempered (3-T) cord–synthetic cord tempered by Tension, Temperature and Time.

What's your pay-off from this dimensional stability?

When you're belting multiple drives, it's your one guarantee that every set of matched belts will *really* match. No matter how long you store them, they'll *stay* matched, too.

And once they're installed, you've got belts designed and built to work as a perfect team–without individual belts either "loafing" or overworking. In fact, you're protected from all the usual mismatching headaches that also include slipping, stretching, scorching.

In other words, you're belted for maximum trouble-free horsepower hours at minimum cost. There's no substitute for that kind of performance – or for the V-Belts with the Green Seal that give it to you – every time.

So see your dealer about the V-Belts with true dimensional stability–the V-Belts with the Green Seal. Or write Goodyear, Industrial Products Division, Lincoln 2, Nebraska, or Akron 16, Ohio.

DIMENSIONALLY STABLE V-BELTS
with the GREEN SEAL by

GOODYEAR

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What's happening in SCIENCE

Souped-up energy at work—meet the maser

Last year few people had even heard of the maser; fewer still knew how it could be used. But before this year is out, we may all be running on maser time, flying by maser control, and looking to masers to help protect us from aggression.

What is a maser? The word itself is a contraction, made from the initial letters of "Microwave Amplification by Stimulated Emission of Radiation," and masers are also known as *molecular oscillators, versitrons,* and *quantum-mechanical amplifiers.* These labels don't begin to tell the whole story of what they are, or of what they can do.

Masers are devices, made with gases or solids, in which atoms or molecules can be raised to a high energy level—a level at which they are unstable. An incoming signal will cause them to radiate the excess energy, at a specific wavelength. The energy emitted can greatly exceed the incoming signal—and there's your amplification.

Furthermore, if gaseous, the maser can produce oscillations of amazing precision and uniformity. This fact has brought the maser into the time-standard field. The "ammonia atomic clock" now under test by the National Bureau of Standards (Nov. 4, p. 12) is actually an ammonia maser: Ammonia gas normally contains molecules in two energy states, and a beam of the gas can be split into two almost-equal parts, one with high- and the other with low-energy molecules. If, then, the high-energy ones are led into a tuned cavity, they can be made to emit the excess energy and set up oscillations, the frequency of which is highly stable and reliable. The low-energy molecules can also be put to work, by "pumping them up" to a high energy level with the aid of external radiation.

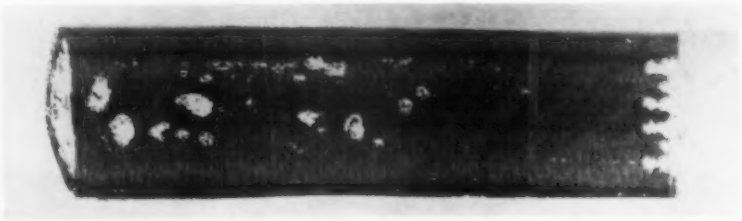
In solid-state masers—crystals of potassium cobalticyanide, for instance—separation of the high- and low-energy molecules is a bit more difficult, and must generally be done at temperatures close to absolute zero (another application for cryogenic equipment, incidentally—see Dec. 2, p. 16).

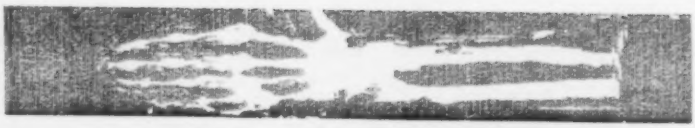
The sensitivity and amplification ability of masers account for their future in such applications as radar and radioastronomy. They can literally "hear" radiations from the clouds of matter in outer space. They have more immediate applications as well—witness the fact that industrial as well as university laboratories here and in Europe (East as well as West) are working with them. Among the pioneers in this country: Columbia, Harvard, Bell Labs. —ARG

Taking pictures with sound

X-ray pictures with sound waves? Argonne National Laboratory is demonstrating it can be done, though the "pictures" aren't yet of standard quality. W. A. Beck of Argonne's Metallurgy Division pioneered the technique when he needed ultrasonic inspection of reactor fuel elements to detect discontinuities in the bond between the fuel and its cladding. Then he turned the device on himself and showed that a usable "X-ray" of the hand could be made.

Standard ultrasonic equipment is used, with two crystals—one to transmit, one to receive the vibrations. When the scanner encounters a flaw in the fuel element (or a bone in the hand), reception is interrupted and a white space appears on the electrosensitive recording sheet (see photos).





Sound waves look inside reactor fuel elements, produce X-ray-like record on electrosensitive paper. Top photo shows flaws in reactor fuel element; below it, same method pictures bones in hand.

What's happening in MATERIALS

Steel: What the oxygen process means

Late last month, with considerable fanfare, Jones & Laughlin dedicated two new steel furnaces, the first large-scale installation of its kind in this country, but by no means the last. Why are they noteworthy? They're built to take advantage of the new European oxygen process which, as J&L points out, promises to "combine most of the speed and economy of the Bessemer converter" with "the quality of the open-hearth furnace."

Steel produced in the new installation, which has a rated capacity of 750,000 tons a year, promises to be low in nitrogen, phosphorous and sulfur, consequently high in ductility. J&L plans turning the metal into cold-heading wire, tin plate, and light structurals.

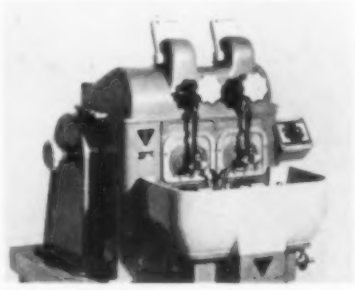
The furnaces use a jet of high-purity oxygen in place of the usual air mixture, turn out a 54-ton heat in little more than a half hour (compared with 8 hr or more for the open hearth). This brings initial investment per ingot ton of annual capacity way down—about $15, compared with $40.

The saving is not all gravy, though. The process is hard on the furnace lining, which must be replaced every week or 10 days. Because replacement takes about 5 days, J&L plans to operate its furnaces alternately, repairing one while the other is working. However, Kaiser Steel, which is building three furnaces, apparently hopes to prolong refractory life or reduce relining time to a point where at least two of the three can be in operation most of the time. Rated annual capacity of this Kaiser installation is 1,440,000 tons.

Higher-quality steel is promised by new oxygen process, now getting its first large-scale US tryout at J&L Aliquippa Works. Here, metallurgists sample heat.

Triple-threat plastic coatings

For coatings that contribute color, cushioning and corrosion protection, plastisols are gaining popularity, as witness the recent formation of the Vinyl Dispersions Div. of the Society of the Plastics Industry. These combinations of plastic resin, fillers and pigments in any one of a number of hydrocarbon vehicles are being applied to products ranging from lens grinders (photo) to automatic dishwashers and ice cream freezers.



Plastisol coating, sprayed and fused on inside of the lens grinder bowl, protects bowl from corrosion; cushions lenses against breakage. Formulation used here is supplied by Stanley Chemical Div., The Stanley Works, East Berlin, Conn.

Plastisols can be obtained in liquid or paste form, and applied by spraying, dipping, roller coating, or any one of a number of other techniques. Baking (at about 350 F) then evaporates volatile elements and fuses the resin particles into a continuous coating.

The idea of using plastisol coatings is by no means new. But these dispersions are now greatly improved, particularly in hardness and scuff resistance, and there are at least half a dozen suppliers of the basic resins, and twice as many specialty formulators who can tailor the resins for specific jobs. In addition, at least one company produces plastisol-coated sheet steel in various sizes and gages.

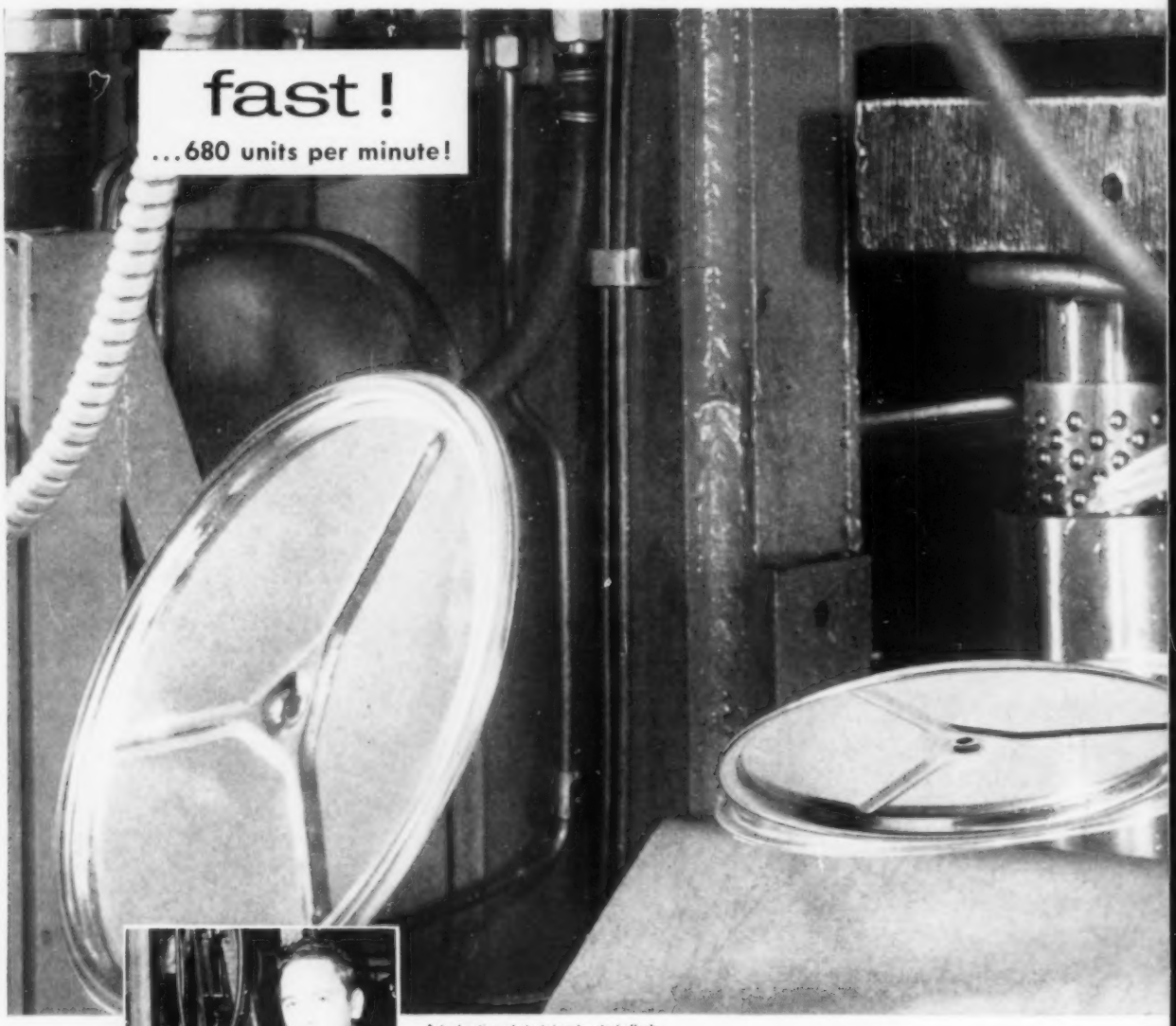
Coming up in '58

What will happen this year to last year's new materials? Here are half a dozen developments, previewed on these pages in 1957, that will be ready to go in 1958—and well worth investigating:

- For protective coatings, structural panels and light-diffusers, glass-flake materials that offer new advantages on several counts should be available by early February (Nov. 4, p. 5).
- For electrical, electronic, and nuclear-reactor components, rhenium metal will be obtainable in commercial forms and sizes. Production is expected to reach about 10 lb a month—not much in comparison with the common metals, but a vast increase for this rare one (Dec. 16, p. 6).
- For gears, roller bearings, bushings, and other mechanical parts, more linear polyethylene (Nov. 18, p. 17) will be available. At least three producers will be onstream this year, and a half dozen others are designing or building plants.
- New faces in the plastics field—and perhaps in polyethylene—will include at least one, and possibly three, big oil companies which have not previously been resin suppliers. Shell Oil says it is "exploring sites for a synthetic resins and plastics plant," though it does not say what type or types of resins it plans to make. Esso Research & Engineering already has a Ziegler Process (linear polyethylene) license. And Sun Oil Company is reportedly taking a close look at the plastics field.
- A wider variety of foams—polyethers, polyesters, and castor-oil-based urethanes in a wider range of rigidities and densities will be obtainable for mechanical products (gripping and conveying belts, for instance—see Oct. 21, p. 6), as well as for padding and cushioning applications.

fast!

...680 units per minute!



Actual action photo taken by stroboflash

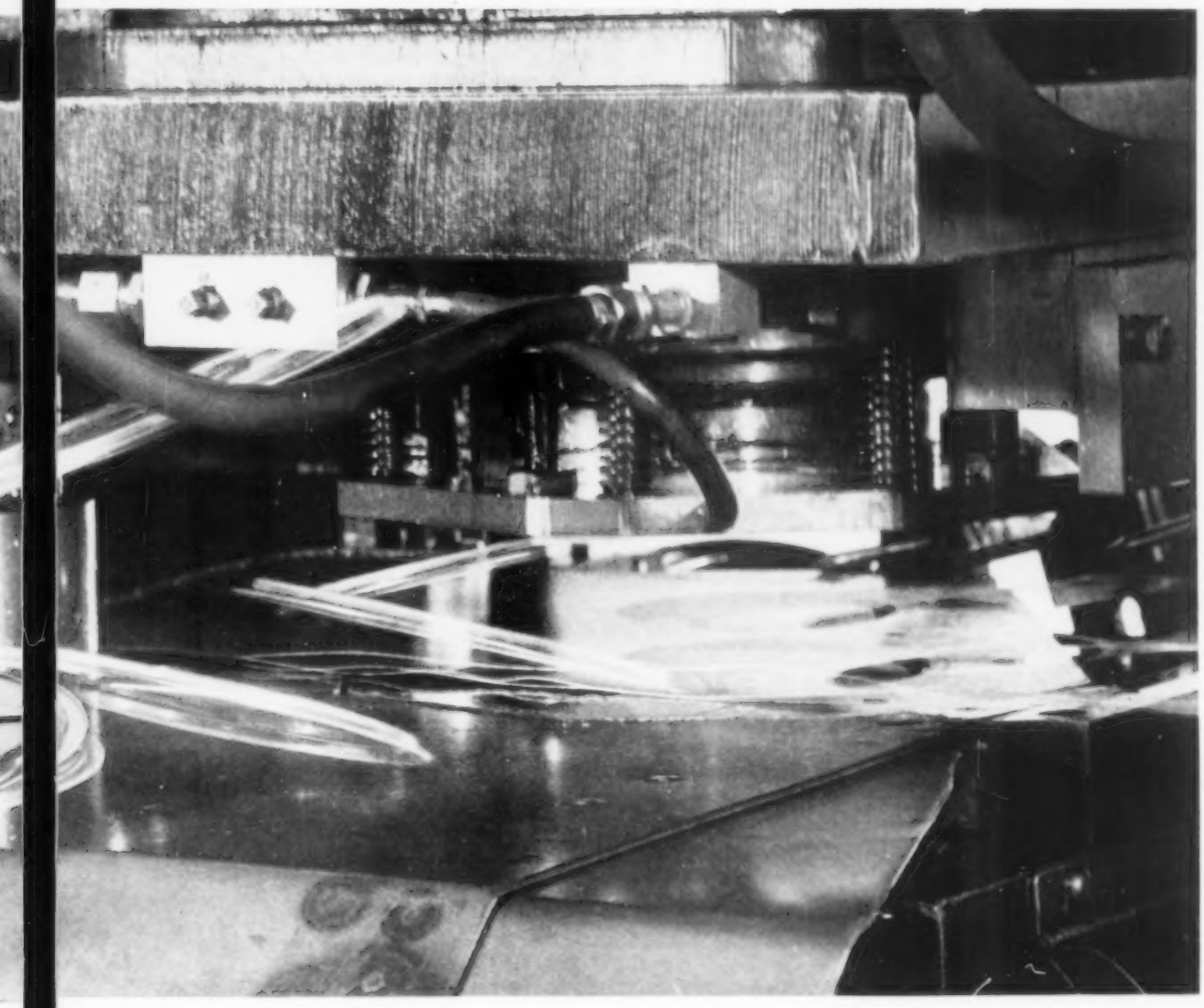
"Gunner" Don Lang, "zeros in" on top profits for our customers with his high-speed Flexopress ripping out machine-gun bursts of 680 component parts per minute.

automatic

Speed plus accuracy equals low-cost volume.

That's the formula for success in component part production *and* purchasing, because you only benefit from quantity buying when you have a source that's set up for *quantity* and *quality* production.

We have high-speed equipment unduplicated anywhere in America, that can



weapon...peacetime style!

be tooled to your job, if your job can absorb real quantity runs. The resultant saving is what we call "pushbutton profit" for you, the buyer. It comes from *automatic* operation, making thousands of units every hour of the run.

If "pushbutton profits" appeal to you and pushbutton methods can be applied to your job, send us your inquiries, for prompt quotation.

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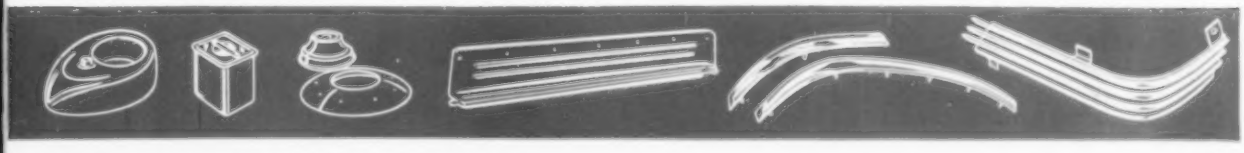
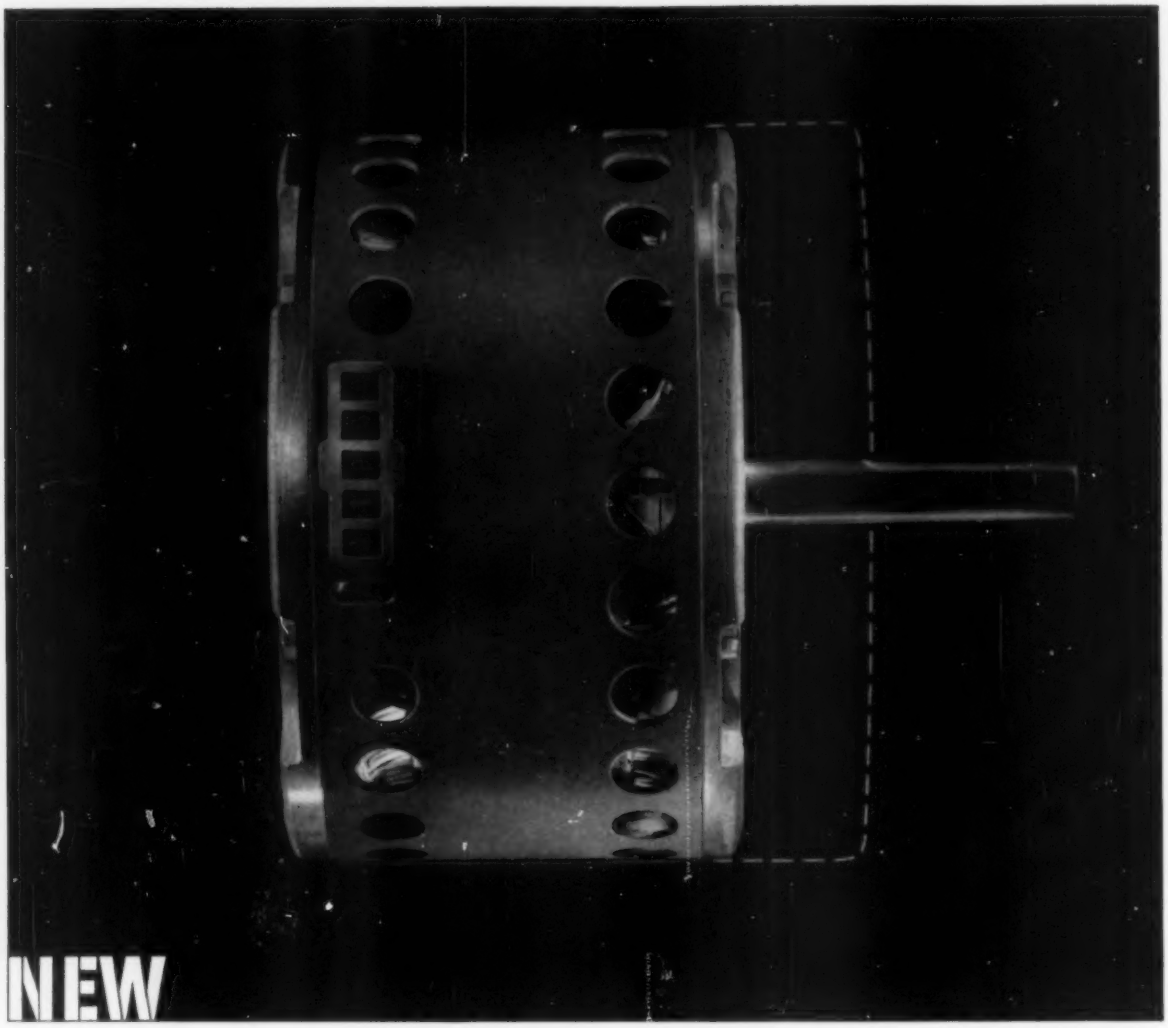




DELCO FAN MOTOR IS SHORTER

Both shaded pole and permanent split capacitor designs save 20% in length

Delco has cut the size of shaded pole and split capacitor motors. The new designs are only four-fifths the length of previous models.

The new Delco motor is quieter and has a unique lubricating system. The lubricating compound consists of a cellulose carrier combined with a very high percentage of oil. This fluid combination provides superior lubrication under all operating conditions. The new motor can be mounted in any position. The lubricant carrier and efficient enclosure of the lubricant chamber combine to retain the oil effectively regardless of mounting position.

Both motors are available with one or both end frames enclosed and either full or partially ventilated main frames for maximum flexibility in product design. Sizes include 1/15, 1/10, 1/8, 1/6 and 1/4 h.p. in a wide choice of rigid and resilient mountings.

Contact your Delco Products sales office and get all the details on this new, smaller motor. Find out what a great advantage its smaller size can mean in your product.

MOISTURE RESISTANT INSULATION – Insulation components have been improved to offer maximum protection against moisture in high humidity air conditioning applications.

BUILT-IN TERMINAL BLOCK – Attachment of leads is fast and easy. Block may be used for one- or two-speed operation.

RUST RESISTANT THROUGHOUT – All metal parts are specially treated to resist rust and corrosion.

BEARINGS – Full steel backed babbitt bearings are precision bored to exacting tolerances . . . are set in rigid frames to maintain accurate alignment.

DELCO MOTORS

Delco Products,
Division of General Motors, Dayton, Ohio

- APPLIANCE MOTORS • INDUSTRIAL MOTORS
- GENERATORS • ACTUATORS
- AUTOMOTIVE AND HYDRAULIC EQUIPMENT
- HERMETIC MOTORS AND CONTROLS
- RESIDENTIAL GARAGE DOOR OPERATORS
- AIR SUSPENSION COMPONENTS

The *Second* Step

A brand-new electronically controlled internal grinder, several years back, was eventually paralleled by a cam-controlled model. The designers felt they'd taken two steps forward and one back, but the sales department sold more customers the cam-controlled model because its was familiar.

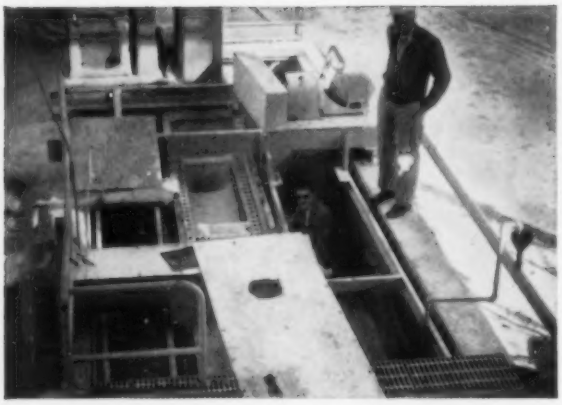
For years before that, textile-loom designers produced new types, but the salesmen sold the old slow ones. The reason? Customers again. They had hundreds of looms of the old type; they didn't want to complicate operation and maintenance with "new-fangled gadgets."

In more-recent machines, automatic controls are frequently questioned. Chemical processors look at their automatic plants and say, "Where can we find the half man we need for an operator?" Now comes R. L. Witzke and A. R. Jones of Westinghouse, talking of nuclear power plants: "Operation of an atomic plant in the normal power range is an exceedingly routine task, yet the plant should not be left unattended." To take full advantage of plant personnel, they suggest that "most of the auxiliary systems can and possibly should be manually controlled." This, they point out, will save capital investment.

It seems to us that these are all examples of the same thing—growing pains. We take the forward step, then are faintly alarmed by what we've done. There's nothing wrong with the trend toward automatic control, properly handled, but there's more to worry about. And being human, the customers worry.

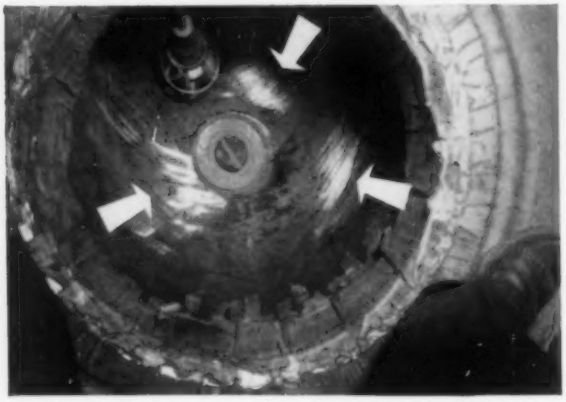
Engineers sometimes worry, too, and for little more reason. Some years ago, research men at Crompton & Knowles made high-speed movies of the shuttle in a loom. The movies showed a loop of the thread forming as the shuttle started back through the warp, a loop that threatened to catch the shuttle and foul the throw. It didn't, but it looked as if it might. Finally, one man of practical mind said, "Look, we've made thousands of these looms, and they've run for years without fouling. The loop has always been there . . . but we had no movies to show it. So why not assume the loop will always miss as it has been doing?"

Here, as in automatic control, acceptance is very important. The first step is to add new knowledge, the second to learn to trust it. Both steps must be taken before the knowledge can truly be thought of as ours. And in many ways, the second step is the harder of the two to take.

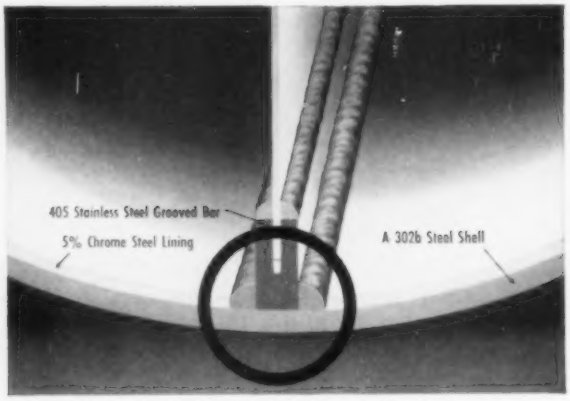


Weld: 304 stainless to mild steel
Conditions: chloride corrosion **Equipment:** drag conveyor

Weld: Inconel* nickel-chromium alloy to ordinary steel
Conditions: high temperature **Equipment:** furnace retort



Weld: repair of cracks in carbon-molybdenum steel
Conditions: no preheat possible **Equipment:** throttle valve



Weld: 405 stainless to 5% chrome steel and A302-B steel
Conditions: high pressure **Equipment:** pressure vessel

Now one electrode, Inco-Rod "A", ...permits new design freedom

No longer need difficulty in welding dissimilar alloys limit design possibilities.

With Inco-Rod "A"* electrode, "problem" welds like those above are being made every day – without special equipment and without special training for weldors. Many users also report remarkable success with Inco-Rod "A" electrode in field welds where preheating is impossible.

Dissimilar alloy welds made with Inco-Rod "A" electrode are strong, ductile and resistant to corrosion in many media. They have high impact resistance at sub-zero temperatures and good stress rupture properties at elevated temperatures.

When a projected design calls for joining two or more dissimilar alloys, remember that Inco-Rod "A" electrode turns many "impractical" welds into routine jobs . . . permits you to use the materials best suited for the application you have in mind.

To get a clearer idea of the jobs Inco-Rod "A" electrode can do, write for our new folder. It contains many case histories and gives useful tips on getting strong, sound, corrosion-resisting welds between dissimilar alloys.

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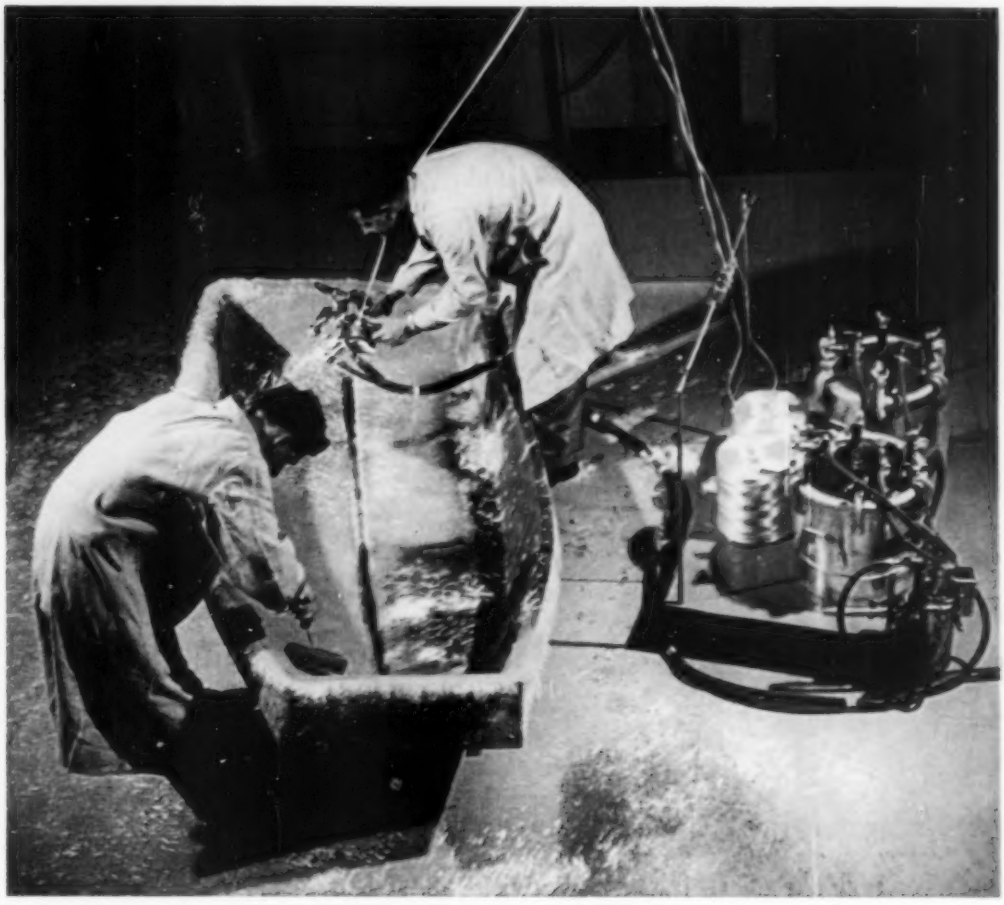
INCO

Inco-Rod "A" electrode is supplied in four diameters: 3/32-, 1/8-, 5/32-, and 3/16-inch . . . packed in 5-lb. asphalt-lined containers.

INCO WELDING PRODUCTS

Electrodes • Wires • Fluxes



NOW—SPRAYED REINFORCED PLASTICS

Designed to replace the present hand lay-up methods of making glass fiber reinforced plastic products, the twin-nozzled gun being operated in the picture above shows how it is used to make a boat in roughly half the time required by existing methods. A fiber-resin depositor, it simultaneously deposits catalyzed and accelerated resin from the two nozzles while shooting out chopped fiber-glass rovings that are completely wetted down as they hit the surface.

Developed by Rand Development Corp., Cleveland 10, Ohio, the gun has been used experimentally to make boats, chairs, power lawnmower housings, outboard-motor housings, wheelbarrow trays, large mixing trays, water baskets for washing machines, truck fenders, and even caskets. Dr. H. J. Rand, president of the Company says, "Actually, as long as we have the mold to spray on, the number of products is unlimited. It's just a case of finding the time to test each one. We can make a finished laminate for $1 per pound. Aircraft laminates sell for $5 per pound."

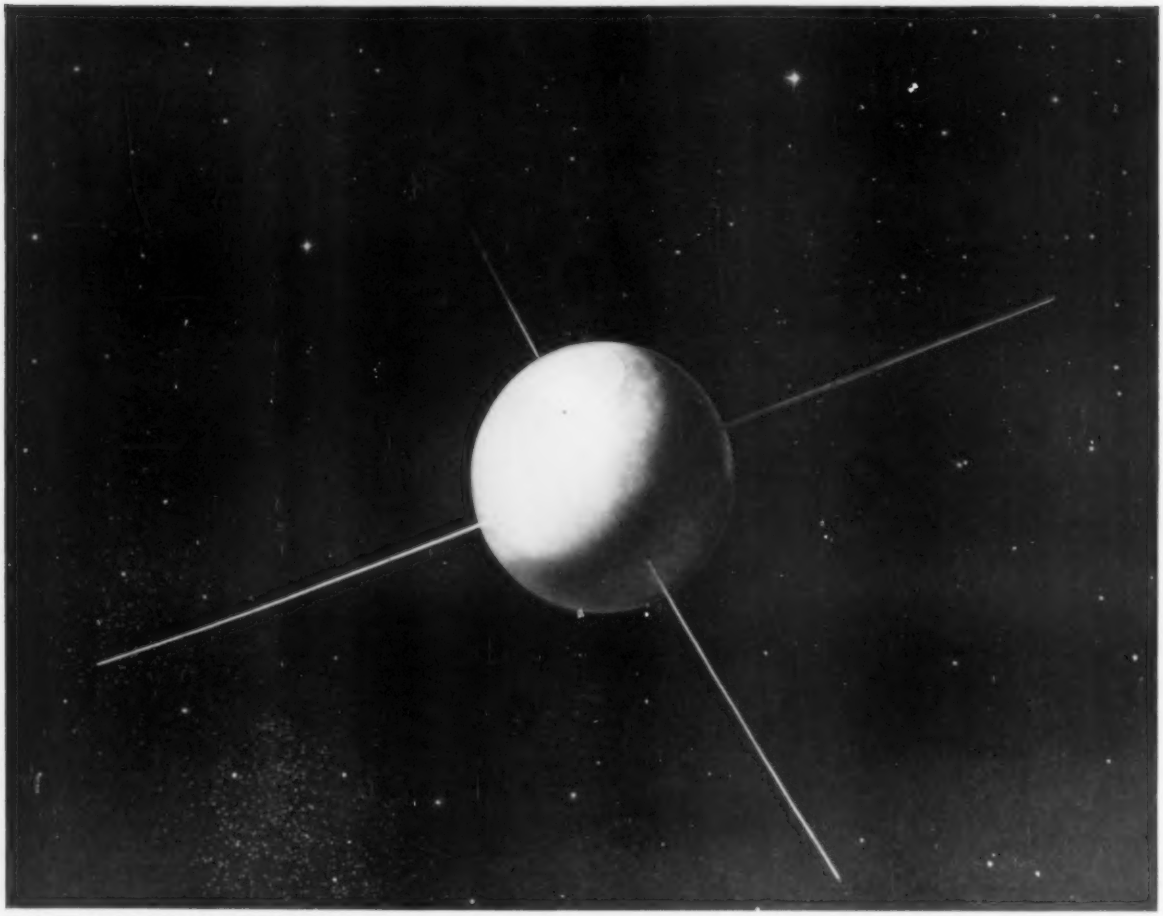
ADVANTAGES

Reduced labor and product costs are the main advantages. The process uses glass rovings instead of the more expensive mat or cloth. Preforming or tailoring is eliminated. Long resin-pot life (at least 48 hr) is possible. Curing time is reduced (handling hardness in 1 hr). Parts have higher physical properties, and improved surface finish. Repair steps are minimized.

HOW IT WORKS

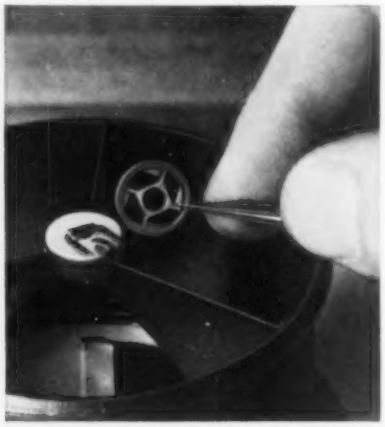
Resin is sprayed from both nozzles. A catalyst is simultaneously sprayed through one nozzle while an accelerator is sprayed through the other. Both guns have to be calibrated to deliver the amount of resin in correct proportions to amount of glass being cut. Continuous fiberglass rovings are fed through a rotary cutter that shoots the cut rovings onto the plastic-wetted surface. Depending on the number of cutting blades used, fiber lengths can be preset in multiples of ¼ in.,

(continued on page 19)



WEATHER PREDICTIONS FROM OUTER SPACE. Far more accurate weather forecasts will be one of America's scientific achievements during the International Geophysical Year. They will begin when America's earth satellite hurtles into space. Present predictions are based on data covering only 5% of the earth's surface. But forecasters soon will draw clues from cloud patterns, radiation, thickness, types and moisture content—revealed by our satellite orbiting around the earth. National's PHENOLITE will help.

WEATHER EYES TO MEASURE CLOUD RADIATION. In the U.S. satellite, two "Weather Eyes" will peer from outer space at earth's cloud layer. Planned by the U.S. Army Signal Corps Engineering Laboratories and developed by the Perkin-Elmer Corp., Norwalk, Conn. to measure cloud radiation, these 4-ounce instruments are hardly larger than a pack of cigarettes. Each uses an f/0.7 mirror to pick up infrared cloud radiation and focus it on a tiny detector unit.



PHENOLITE WINS BERTH ON EARTH SATELLITE. In the "Weather Eyes" and in the satellite's silicon solar battery system, tiny but essential pieces of National PHENOLITE laminated plastic serve as printed circuit base and insulating spacers. To qualify for this job, PHENOLITE had to meet stringent specifications in dimensional stability, light weight and ability to withstand a wide range of operating temperatures. Perkin-Elmer selected PHENOLITE Grade G-10-865 because it meets all of these requirements.

NATIONAL CAN HELP YOU...

reduce product cost or improve product performance at no added cost. Here's why . . . you can select "the one best material" from over 100 grades of PHENOLITE®, Vulcanized Fibre and National Nylon—without compromise in properties or cost. You can simplify production and purchasing with the timed delivery of 100% usable parts — from a single reliable source. You gain competitively with National's new materials and grades —the direct results of programmed materials research.

You benefit by calling National first. Check Sweets PD File 2 b/na, the telephone directory Yellow Pages, or write Wilmington 99, Delaware, Dept. H-1.

NATIONAL

VULCANIZED FIBRE CO

WILMINGTON 99, DELAWARE

In Canada:

NATIONAL FIBRE COMPANY OF CANADA, LTD., Toronto 3, Ontario

the longest being just over 4 in. long when one blade is used. After one pass is made over the mold, the chopped strands are rolled down by hand to make an air-free laminate that will gel in a few minutes. This procedure is repeated until the desired thickness is built up. A $\frac{1}{8}$ in. thick laminate (rolled-out thickness) is the maximum thickness possible for each pass.

Output of the gun depends on quantity of fiberglass cut per minute. The ratio by weight of resin to glass can be varied to suit any requirements up to 40% glass content. A voltage control of the cutter motor varies the rpm to permit some variation during actual depositing. The output also can be varied by the number and weight of the rovings fed into it.

To use a fiber-resin depositor to best advantage, a crew of three is used—one to operate the gun, and two to roll down the chopped fiber and resin. Even with output cut to about half of its maximum, three men can build, at the rate of 160 lb. per hour a simple product like a boat.

When making small, detailed parts, a low glass output cut into short lengths is preferred; for large objects the reverse is true. The new gun will deliver from $\frac{1}{2}$ lb to 6 lb of glass and resin per minute. It has been estimated that one gun has the same capacity in terms of glass cut per minute as an $8-9000 preform machine. And, there is no mat storage and shipping problem.

Greater strength than with the mat-lay-up method was achieved with almost all parts made by the spray method. Reasons: high glass-resin ratio; the absence of undesirable binders; improved fiber distribution and wetting, and the elimination of trapped air bubbles.

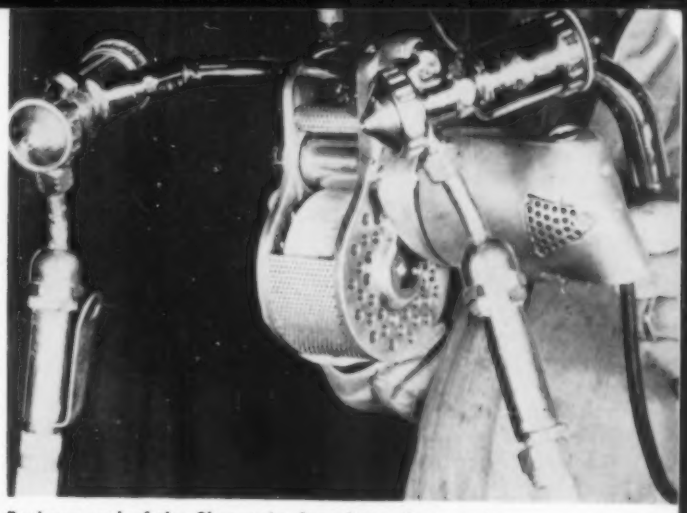
Some tensile-strength figures: Using a continuous-fiber roving with a hard chrome finish cut into $1\frac{1}{4}$ in. lengths, a maximum stress of 15,600 psi was obtained on a 0.040-sq-in. cross-section. A spun roving with a soft chrome finish cut to $\frac{3}{4}$ in. lengths had a maximum stress of 13,850 psi on a 0.0700-sq-in. cross-section.

Flexural Strengths: A $\frac{1}{8}$-in. thick piece made by folding over a laminate, and smooth on both sides had a maximum stress of 18,450 psi after a room cure of one week. With a post-cure of $1\frac{1}{2}$ hr at 250 F, this strength increased to 27,250 psi. The test specimen had a glass content of 30%.

Resin Types: polyesters are used for the boats. The gun was developed for this. However, work is being done on epoxies.

Originally the blades were made of high-speed steel; costing about $2.40. They cut the roving against a nylon sleeve, but had a short life—cutting less than 100 lb of roving before they had to be sharpened or changed. On the new model, standard injector-razor blades are used and cut the roving against a special rubber roller. Both the blades and rollers have a long life, and will cut hundreds of pounds of roving before they have to be changed.

Rand who has patented the process and the gun, will manufacture the spray guns and license them for a percentage royalty on the products.



Business end of the fiber-resin depositor. One nozzle sprays the resin and a catalyst and the other nozzle sprays resin and the accelerator. Glass fiber rovings are cut by the rotating cutter and spewed out at the center.

◀ **Rolling down rovings** after spraying process. This is done after each layer of rovings have been applied to insure complete wetting of the fibers. Each rolled-down layer is 3/64 in. thick.

Cutter wheel with one of the injector-razor-type blades being removed. With all blades inserted, glass rovings are cut to lengths of $\frac{3}{8}$ in. With just one blade, roving length is 4 inches. ▶

Completed hull removed from mold with frayed edges trimmed. Total elapsed time to this point is less than five hrs, labor under two manhours.

MIDWEST NOTES:

Uses for Al mushroom

DETROIT—Light aluminum may soon carve a larger market for itself in applications where corrosion-resistant decorative materials are required. Until now, the light metal has been barred because its major alloy, silicon, leaves anodized castings with tinted or mottled surfaces. A new anodizing process using a special alloy has done well on experimental and pilot-plant scales. When it goes into production, the process will open the way for more aluminum in auto parts and housings for kitchen-appliances.

* * *

How large a production run makes automation economically feasible? Most current thinking says millions or at least several hundred thousand. International Harvester, however, is successfully using an automatic transfer installation to machine intake manifolds. This installation for such a low-production item is economically feasible because it can be adapted to handle manifolds of varied size and design. Lemaire of Detroit manufactured the Harvester installation.

* * *

American Motors, now charting good sales volume in a waning auto market, will press for even larger volume with its new model coming out this month. Company president, George Romney, who believes AM is finally pulling out of the doldrums, bases present sales success on car design. The 100-in. wheel base makes AM cars easy to drive and park. It's also easy on the customer wallet.

* * *

By adding air suspension to highway tractor model DR862, General Motors will reduce the vehicle's weight by a half ton. Reduced shock and vibration that result from air suspension lower strength requirements in other components. That means designers can substitute aluminum for steel in cab and chassis. And it means more of the truck's total weight when traveling can be given to payload—an important advantage "with everybody operating under state weight-regulation maximums" says Philip J. Monaghan, GM V.-P.

Tailor 'Flexible Automation' To Industry Needs

DETROIT—Bendix Aviation Corp. has developed a new corporate engineering, manufacturing, and sales unit for marketing tape-controlled production systems. Purpose: to provide "flexible automation" to aircraft fabricators, machine tool producers, and other potential users— makers of forging dies, die castings, sheet metal parts.

The firm's tape-run production setups are completely automated systems that control machine tools in all cutting functions. Bendix emphasizes adaptability of the tape, or numerical, control process to different production operations. They say their system largely eliminates manual control in manufacture of many die parts, jigs, and patterns, providing substantial saving in tooling cost and production lead time.

In operation, the tape-controlled systems are designed directly from engineering data. These include specs and dimensions of a finished part and are recorded on a process sheet. The figures are then recorded by a typewriter that simultaneously punches a preliminary tape. The tape can easily be checked for errors. A computer produces the actual control tape to activate a control unit and run a machine tool.

"A control-tape library ultimately will help reduce the huge parts inventories now required in many manufacturing industries," according to Malcolm P. Ferguson, president of Bendix. He cites production of jet turbine blades as a promising aircraft application for the new process. Up to now, he notes, the prototype for each blade has required several hundred man-hours and three to eight weeks to produce. With tape-control, the prototype and several samples are produced in a week, Mr. Ferguson said.

Earlier this year, the process was applied for the first time to a large machine tool when Bendix designed a tape control and power servo system for a 50-ton Kearney & Trecker milling machine now used by the Martin Co. to turn out structural parts for aircraft and missiles. Sixteen numerical control systems have since been delivered for use with other-type milling machines.

* * *

Michigan colleges and universities are announcing changes aimed at tightening admission requirements and reevaluating teaching standards. Detroit Institute of Technology will require Freshman to take courses in the fundamentals of physics, chemistry, biology, geology and astronomy.

See Rise of Feminine Mathematician

LOS ANGELES—The number of women majoring in mathematics at UCLA has nearly doubled in the past three years. In 1956 the math department harbored 56 distaff undergraduates, in 1957, 104. Total math enrollment rose only 15% during 1957. . .

For those who graduate, lush opportunities are available; the demand for mathematicians is skyrocketing. UCLA's Office of Teacher Placement received 616 requests for math graduates to teach in 1956-57. But only seven students—one a coed— were available.

California's mushrooming computer industry is a strong competitor for the short supply. "We get a dozen or more requests for every man or woman we graduate," says Charles B. Tompkins, director of UCLA's Numerical Analysis Research. He trains coders and problem analysts for computer work.

In other fields, the UCLA Bureau of Occupations reports demand is running three times heavier than supply.

Higher salaries and rapid promotions in industry are draining graduates away from teaching. The salary advantage that teaching traditionally offered women is diminishing as industry demand for mathematicians rises and women prove their professional skill.

Moly Gets 2300-F Coating

WHITE PLAINS, N. Y.—By adding a new twist on standard chromizing technique, Chromalloy Corp., of this city, has developed an alloy surface treatment for molybdenum that allows extended operation in air at temperatures up to 2300 F. Molybdenum has exceptional strength but poor oxidation resistance at high temperatures—a disadvantage that has held up wide application of the metal in jet-engine blading, missile combustion chambers, nuclear reactor rods and the like.

Chromalloy's new W-2 process is said to show performance superior to existing molybdenum coatings based on ceramics and spraved or electroplated metal alloys. Tests conducted by the company, showing performance of the diffused chromium surface, are tabulated below. This process is an extension of techniques previously covered in PRODUCT ENGINEERING, Nov. '56, p. 180.

The treatment has been evaluated by others: Climax Molybdenum Co. heated a test panel with gas-air torch to 1800 F in 30 sec, held it there for 15 sec, cooled it to room temperature in 45 sec, and repeated this for 2000 cycles without panel failure. A US government agency interested in moly piping exposed treated tubing to steam at 2500 F for a period of 6 hrs without failure.

Diffused-chromium treatment of columbium also shows promise. Although less subject to oxidation than molybdenum, columbium requires protection at high temperature. Exposure of treated columbium panels to 1800 F for 320 hr during 13 thermal cycles showed no failure.

Flame test . . .
with oxyacetylene torch drives off uncoated molybdenum as volatile oxide (right). Chromized specimen (left) resists oxidation.

Test	Temperature, F	No failure after:	
		Time, hr	Thermal cycles
Panels, treated both sides	2000 2300	400 100	18 5
Strips bent, after treating, to 15° angle	2200 2350	48 400	3 —
Surface-dented by Rockwell-brale under 10, 14, 30 and 60-kg loads	2200 3000	5 ¼	— —
Oxyacetylene torch-heated to 2600 F for 15 sec, O_2 quenched to R.T. in 30 sec. Repeated 30 times and furnace-tested	2200	18	—

World Affairs Group Talks Science

PASADENA, CALIF.—Some straight talk on science came out of the Institute of World Affairs' 34th session from some well-known speakers who spoke on a variety of subjects. Some of the highlights:

Kenneth Holland, president of the Institute of International Education, said Russia's educational advancement began after the revolution. Since then, the country's leaders have emphasized the opportunities for the intelligentsia.

The tenth-year high school student attends classes six days each week for ten months of the year. Roughly 42% of his classroom hours are devoted to science. By his tenth year he already has had ten years of math, four of physics, four of chemistry, and eight of biology, zoology and general science. A seventh-grade student has completed the math usually learned by the 10th grader in the US. The Russian student gets no background in liberal arts and social sciences. But dramatics, fine arts, journalism and music are a good part of his curriculum. Study of a language is begun in the fourth grade—English

(Continued on page 22)

BEAVER
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Successor to the Acme screw drive and preferred in many applications to hydraulic and pneumatic systems. Guaranteed 90% efficient in converting rotary twist to linear push (or vice versa). Employs a stream of precision balls and ground lead to eliminate drag and wear in delicate instruments, aircraft, machine tools, massive wind tunnel jacks, etc. For horizontal and vertical actions, indexing, inching and traversing. Consultation and engineering service available. Write for literature.

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is studied first usually, with German and French added later.

George K. Tanham, of the Rand Corp., pointed out that the British program for atomic energy was prompted by a dire coal shortage, and that the program has progressed so fast that the British now consider themselves seven years ahead of the US. England estimates that 50% of their power will be from nuclear sources by 1975. British reactors are so complicated that the amounts bid by commercial companies vary as much as 40%. Power-plant cost is high, but is made practical by the high coal costs and the uncertain future supply.

Radiation-resistant Grease Developed

SAN FRANCISCO—Shell Oil Co.'s Martinez, Calif. research laboratory has developed a new radiation-resistant grease, for use in nuclear power plants where it will be subject to radiation. The Shell APL Grease is now commercially available.

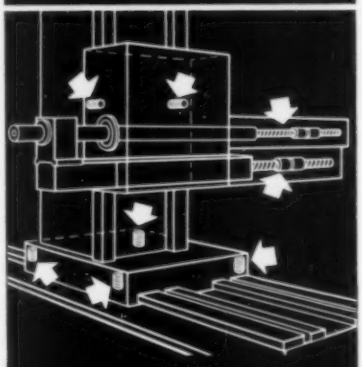
Static radiation tests were conducted at Shell Development Co's research center at Emeryville, Calif., where grease was bombarded by a 3-million volt Van de Graaff electron accelerator. Mechanical stability tests were made in the Atomic Energy Commission facilities at Idaho Falls, Ida. A roll tester was designed to operate in the water shield surrounding the radiation source, fission products of spent U-235 fuel rods.

Hails Engineers' Vote

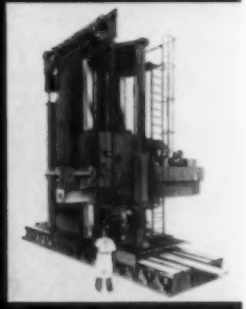
WASHINGTON, D. C.—The National Association of Professional Engineers through its president Garvin H. Dyer has praised a group of Westinghouse engineers who voted against affiliation with a company union. The engineers staff the company's Electronics Div. plant at Baltimore.

In the NLRB-conducted election, the Salaried Employees Association, an affiliate of the Westinghouse Independent Salaried Unions was seeking to represent Westinghouse engineers in collective bargaining negotiations. The union bid was turned down 171 to 115 after an intensive union-vs-management campaign.

Versatility!



THE WORLD'S LARGEST FLOOR TYPE HORIZONTAL BORING - DRILLING - MILLING MACHINE USES 6 BEAVER BALL SCREWS FOR POSITION CLAMPING AND 2 FOR SPINDLE FEED



The same accurate positioning, rigidity and freedom from backlash essential in this huge Giddings and Lewis Model 1210-FUAR with 10" spindle is available to you for improving the efficiency of your equipment. Consultation and engineering service. Write for literature.

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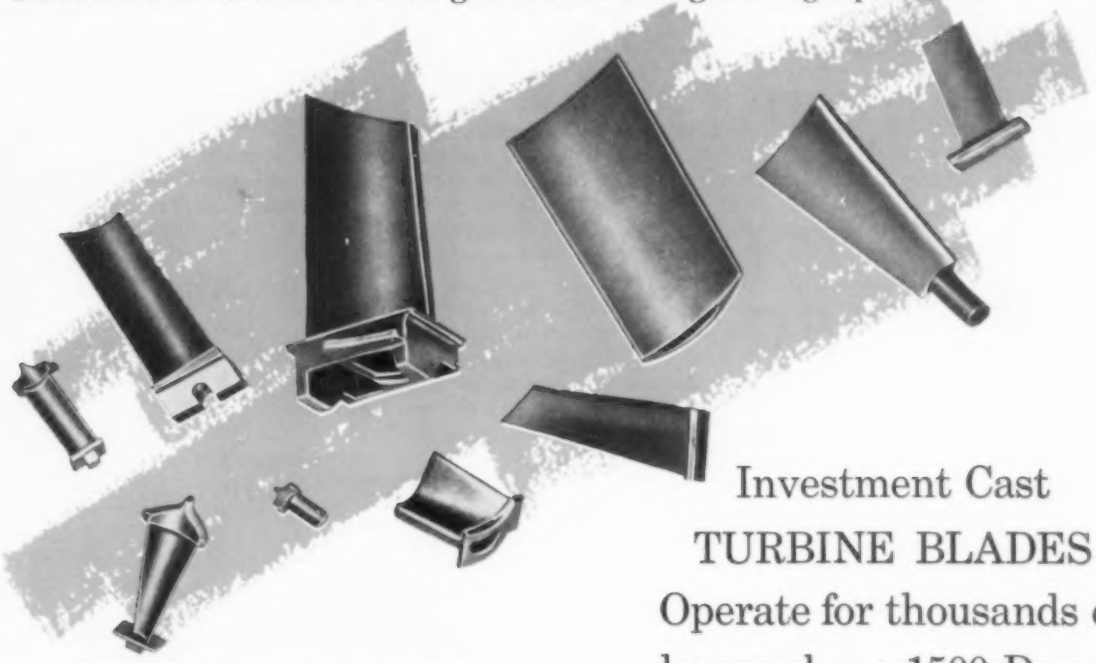
HAYNES investment casting solves the *tough* design problems



Investment Cast TURBINE BLADES Operate for thousands of hours above 1500 Deg. F

The age of supersonic aircraft has created a demand for intricately-shaped turbine blades that have excellent strength and low creep rates at high temperatures. Blades made of HAYNES Alloys meet these requirements and that is why they are used in the fastest gas turbine engines. To mass-produce these blades, HAYNES' investment-casting method has proven the economical answer. Compressor blades, vanes and other aircraft components are also efficiently produced by this modern method. For complete information, write for the booklet "HAYNES' Investment-Casting." Address Haynes Stellite Company, Division of Union Carbide Corporation, General Offices and Works, Kokomo, Indiana.

. . . Testing for soundness – Sample castings of every part produced are X-rayed, as part of the normal inspection procedures set up to insure top quality. This test helps to check foundry practices and also makes sure that the part will meet the necessary requirements for soundness.

HAYNES ALLOYS

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All-out Drive for Government Scientists

WASHINGTON, D. C.—The government, long plagued with its inability to compete with industry for scientific and engineering manpower, is launching an all-out drive to get back in the ballgame.

The Civil Service Commission has already ordered pay boosts for some 45,000 top-of-the-grade scientists and engineers in the $7,500-and-up bracket. Increases of as much of $1,000 a year will be made. Over-all cost to the government: about $25 million yearly, with all but $5 million going to Department of Defense employees. And this is only a stop gap measure, other plans are in the mill to completely revamp federal pay policies, both from a short-range and long-range standpoint.

One study to be completed next month is sponsored jointly by the National Science Foundation and the President's Committee on Scientists and Engineers. It is looking into the nation's manpower needs and will suggest areas where further studies are needed. Idea is to find the soft spots in analyzing manpower, then collect data for realistic manpower planning.

Wage-Scale Comparison

The Labor Department is making a study to get a good comparison of wage scales for government and non-government scientists and engineers.

The Office of Education is polling colleges and universities to get the number of junior-year students majoring in the various branches of science and mathematics.

Idea is that this will give them a two-year forecast on availability of manpower in these specialties. The study will be used, too, in planning scholarship programs, and other aids to education now in the mill.

Here's the Problem

There are not enough qualified engineers and scientists to meet the country's needs. And, even with the expected doubling of technical graduates between now and 1965, increased need will keep them in short supply.

On top of this general situation, the government's manpower problem is worsened by relatively low pay scales and small fringe benefits. The problem becomes acute when the government tries to get or hold on to top-flight personnel.

The government is low man on the totem pole in the manpower race. Although it employs roughly 10% of the nation's engineers and scientists, it is not able to recruit this percentage from university graduates. And more and more of those recruited are coming from the bottom half of the classes.

One government-agency survey of supervisors shows that 42% of the supervisors rate the quality of replacements about equal to those replaced, but 44% rated replacements as lower.

Estimates are that there are about 840,000 scientists and engineers in the country. The government employs some 84,000, roughly 44,000 in Dept. of Defense. About 250,000 of the nation's scientists and engineers are working in research and development, with around 100,000 in defense work.

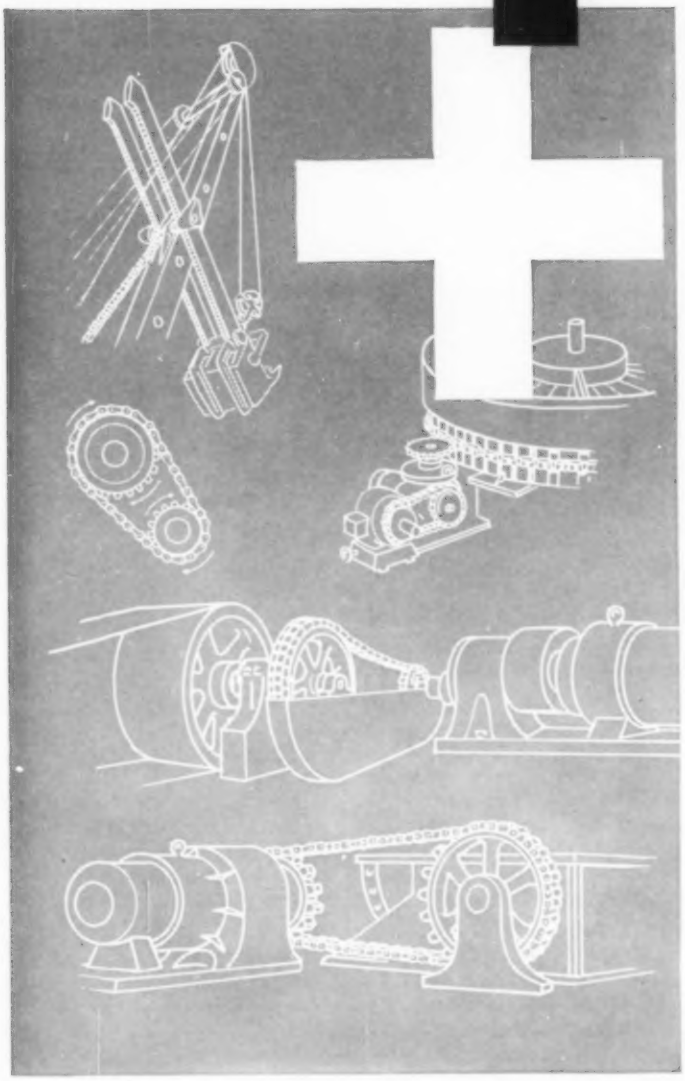
Reactor Output Doubled

LEMONT, ILL.—Operating level of the experimental boiling-water reactor has been more than doubled in experiments at Argonne National Lab. The accomplishment indicates that electrical output of the plant could be substantially increased, reducing cost of plant investment per unit of power, according to Dr. Bernard I. Spinrad, director of the Argonne Reactor Engineering Div. An increase from 20,000 kw of heat to 50,000 kw has been achieved without change in number or arrangement of fuel elements in the reactor core.

Bromo-Seltzer cures missile headache . . .

The connector spilling headache powder is part of wiring for marker that helps technicians find Atlas and Thor flight data dropped in test waters. The powder, packed between contacts, provides time delay before start of transmission to recovery teams. Audio and visual signalling does not start until water melts the powder. GE's Philadelphia Missile and Ordnance technicians turned to Bromo-Seltzer after mechanical switches failed to provide necessary few minutes delay time.

to put a PLUS in your



POWER DRIVES

Plus performance, dependability, economy...these are the extras you want in your designs. But in specifying power drive equipment, how can you be sure that you're getting *plus* values?

One *sure* way is to consult your CHAIN Belt Man. Have him demonstrate the three important *plus* advantages you get with CHAIN Belt:

1. *Plus Value in Product.* Whether it's chain, sprocket, bearing, coupling, take-up, the built-in *plus* quality of CHAIN Belt products puts plus value in your equipment.
2. *Plus Value in Application Assistance.* Your CHAIN Belt Man has the know-how to help you select the right component that assures plus performance at lowest over-all cost. Because he has a complete line, he can recommend, without prejudice, the right choice for your design.
3. *Plus Value in Service.* From your CHAIN Belt Man in the field to the engineering and manufacturing departments in our plants, *plus* service is yours to command. In application, product specification assistance, deliveries that meet your schedules, CHAIN Belt has no equal.

For the story of the *plus* values in CHAIN Belt power drive equipment, turn the page.

CHAIN BELT

QUICKENS THE PACE OF PROGRESS

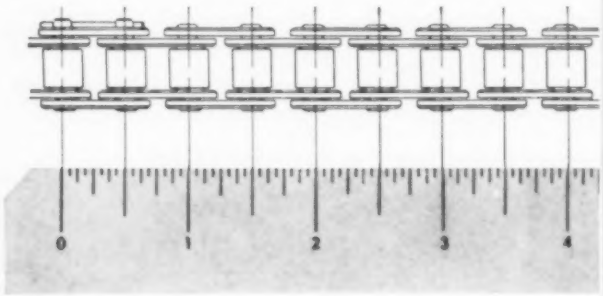
turn page

the PLUS values in...

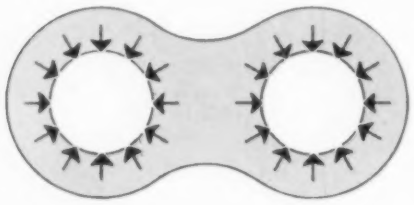
REX® ROLLER CHAIN

The quality of any roller chain can be determined by two factors...its ability to resist wear and fatigue! A chain designed and manufactured to have a longer normal wear life and greater fatigue resistance is a *plus* quality chain. CHAIN Belt's quality in design...manufacture...control...gives you this *plus* ability to resist wear and fatigue. Here are two of the many important differences that make Rex Roller Chain so superior:

IN PITCH CONTROL



In Rex Roller Chain, chain pitch is accurately controlled, not only in the pitch measurement in a chain strand *but in each link* in the strand. This means that every part of the chain carries its full share of the working load. There are no pitch variations to cause uneven loading with resulting early failures of chain parts.

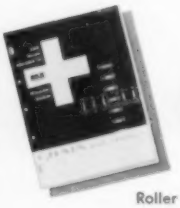


IN LINK PLATES

An important function of the link plates is to maintain the pitch of the chain. To do this, link plate holes must be accurately located in relation to each other and also parallel. To control the drive fits of pins and bushings, plate holes must be accurate in size throughout the thickness of the link. Hole finishes must be smooth and uniform.

You get these features in Rex Roller Chains through a special manufacturing technique of guided piercing of link plate holes...a technique that assures the exact type of link plate hole required, and puts the *plus* wear life and fatigue resistance into these top-quality chains.

For the complete story of the plus values in Rex Roller Chains, send for your copy of Bulletin No. 5725.



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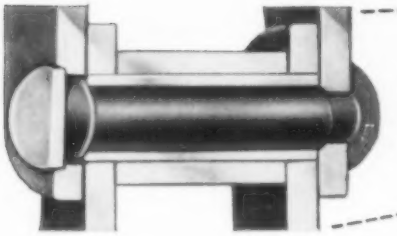
REX® CHABELCO® CHAINS

Where you need power drive chains to handle heavy loads at slow to moderate speeds, the plus quality in Rex Chabelco Steel Chains can put *plus* value into your equipment. These chains, in their service range, are your most economical choice ...will transmit more horsepower per dollar. They have the rugged strength... the designed-in dependability...that resist heavy shock loads and tough operating conditions. Here are two important reasons why:



IN PLANNED TOLERANCES

The press fit of pins and bushing in chain side plates is an important factor in chain life...in its ability to resist shock loads. In Rex Chabelco Chains, these tolerances are "designed in" and held through precisely controlled manufacturing techniques. Even the pins and rivets of these chains have highly finished surfaces to provide the required precise fits. You get the maximum bearing area for longest possible chain life.

IN POSITIVE LOCKS

Turning of the chain pins in the side plates causes excessive wear in the side plate hole in any chain...destroys chain pitch...results in early chain failure. In Rex Chabelco, pins have a special-shaped milled flat on the end which fits into a special hole in the side plate. This positive lock, plus the controlled press fits, prevents any turning of the pin...assures longest chain life. For the story on Rex Chabelco Chains, send for your copy of Bulletin No. 56-57.

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Chabelco Chains • Cast Chains • TableTop Chains • Drop Forged Chains • Sprockets • Set Collars • Elevator Buckets

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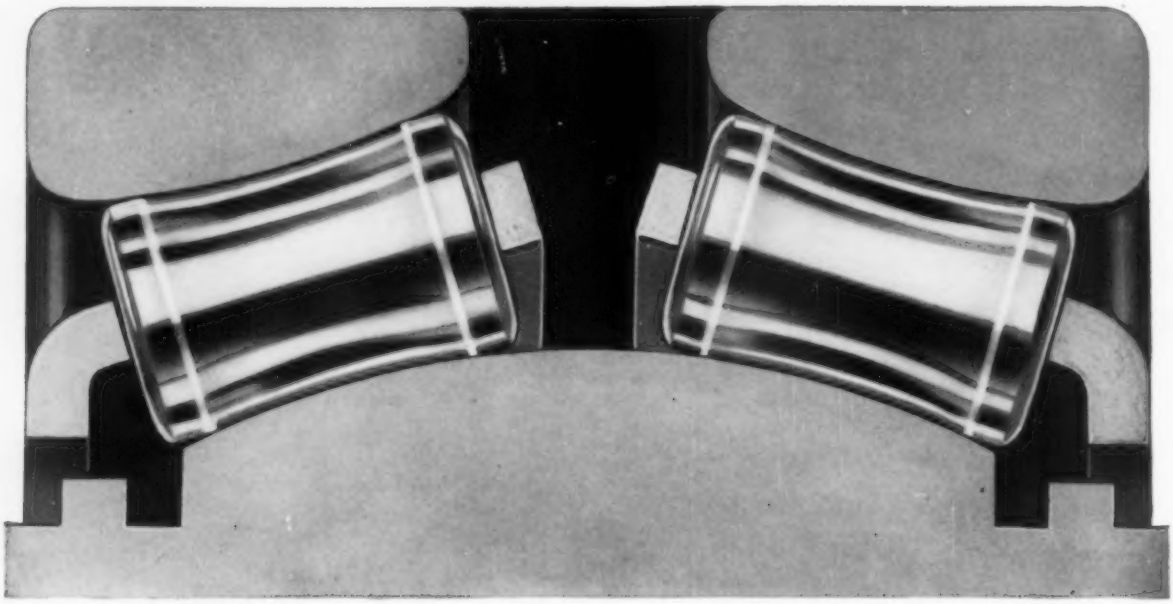
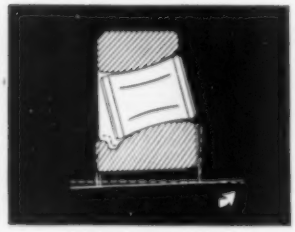


the PLUS *values in* SHAFER® BEARINGS

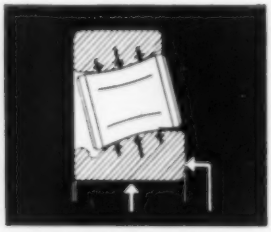
Combine the low-rolling friction of a ball...the high load-carrying capacity of a roller...and you have the *plus* advantages in Shafer Self-Aligning Roller Bearings. These bearings maintain their high load-carrying capacity under shock loads...continuous heavy-duty loads under misalignments.

Specifying Shafer puts an important *plus* in better service...longer life for your customers. Remember, a Shafer Bearing will deliver its rated load capacity for *five years or more*. Compare this with other bearings with an average life rating of one year or less. Here's why!



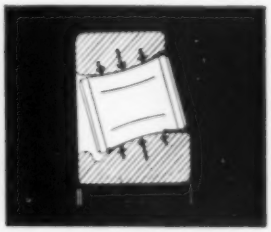
SHAFT DEFLECTION

Shafer design permits unrestricted compensation for shaft deflections, misalignment, shock loads...permits a total of 3° of misalignment.

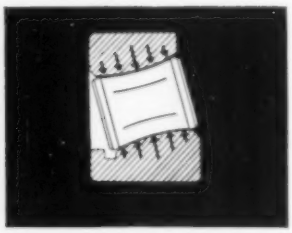


RADIAL, THRUST OR COMBINED LOADS

Shafer free-roller design handles radial, thrust or combined loads without loss of bearing capacity. There is no roller end wear...no need for guide flange at roller end.



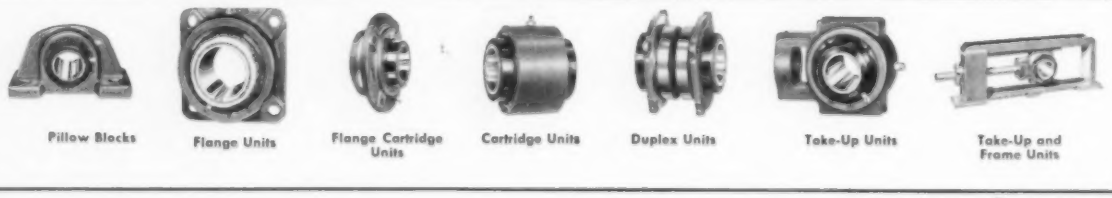
Under Normal Load



Under Heavy Load

SHOCK RESISTANCE

The high inherent elasticity of the bearing-quality alloy steel rollers and raceways provides maximum resistance to shock loads. The elasticity of these rollers and raceways permits compression under load and shocks... the contact area increases to fit the bearing area to the load requirement.



Pillow Blocks | Flange Units | Flange Cartridge Units | Cartridge Units | Duplex Units | Take-Up Units | Take-Up and Frame Units

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For complete data on the *plus* advantages of Shafer Bearings, write for your copy of Bulletin No. 55.

SHOULD YOU USE OUTSIDE INVENTORS?

DO NOT solicit ideas from outside! Solicitation increases legal risk with no corresponding increase in the number of useful ideas. However, a carefully planned screening setup may bring in some excellent new products and be good public relations as well.

GEORGE S. HASTINGS
Vice-president in Charge of Patents
American Machine & Foundry Co.

Why use outside inventors? Because if you don't you're overlooking a major source of corporate stimulation.

After all, how do companies grow? Either they acquire other companies or they develop a diversified line of products from within. Company acquisitions are limited by antitrust laws, and to develop a diversified line from within is easier said than done. Corporations are often limited by the very factors that brought them success in a specialized field.

The company design department does not have a monopoly on ideas (though often it may think it does) and inventors are not all geniuses. But if the company is in a business with which the public is familiar (bicycles or bowling equipment, for example) it will definitely pay to work out ways to receive these ideas.

THE RISKS

Should a company solicit ideas from outside inventors? Corporate consensus on this question is emphatically no! First of all, any sort of solicitation greatly increases the number of ideas to be screened without a corresponding increase in the number of useful ideas received.

Secondly, solicitation increases the legal risk. There is an implied obligation to pay for ideas used and it might not be at all easy to prove that you had the idea long before it was submitted.

And suppose a number of different people submit the same idea? If it is a good one it would be almost impossible to use it with fair credit (and remuneration) to everyone concerned.

These risks are well illustrated in the case of Ackermans vs General Motors (Court of Appeals, 4th Circuit, 1953). Ackermans submitted an improvement in convertible tops to several automotive manufacturers. Some time later GM put out cars of a somewhat different form than that disclosed by Ackermans. The court not only held that GM infringed the patent, but that GM should pay damages for the breach of confidential disclosure implied from the fact that the application had been shown to them.

SOME PRECAUTIONS

A number of companies have considered this problem and have decided that it is still worth the risk. They have set up procedures somewhat as follows:

1 Personnel likely to receive such disclosures are instructed to send them immediately to a single, responsible, administrative person. Such disclosures are not seen by technical or engineering personnel until ground rules have been established with the outside submitter.

2 Ground rules are established by sending the submitter an agreement form which he is asked to sign and return. This form sets forth the basis on which the company will receive the disclosure. It has a number of conditions: no confidential relation; no commitment is made to compensate; the company does not agree to do more than state whether it is interested; it is suggested that the submitter's sole remedy is to enforce his rights under the patent laws.

EVALUATION

There are several steps common to good evaluation procedure. The procedure first applies those tests which are inexpensive and most likely to determine the unsuitability of the particular product.

1 Initial screening

2 Secure an option on the new product

3 Determine technical feasibility

4 Determine patent feasibility

5 Determine marketing feasibility

6 Study the relationship of the submitted idea to the company's business. A good way of doing this is to compare a list of the company's manufacturing and other facilities, skills, selling ability, research and engineering background, and so on against the requirements of the submitted product.

7 Test for degree of completion (see chart, p. 30).

8 Is the company being asked to do a pioneering job in an unchartered, if attractive, field? If so, remember "The way for the pioneer is hard," and double or triple all development cost estimates.

INVESTMENT VALUE

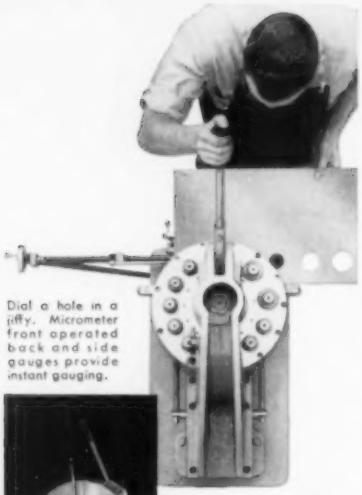
How good an investment is this for the company? It is possible to derive a formula for the investment worth of a new product.

$$X = \frac{PS}{C}$$

where P is the cumulative net profits over the probable commercial life of the product, S is the chance of success and C is the cost of carrying the project through from the beginning to successful commercialization, including any payments to the inventor.

Quantity S is expressed as a fraction of 1, which would represent complete success. This value is the product of a series of fractions. For instance, if it is estimated that there is one chance in ten that the engineering problems cannot be solved at a

NOTE: This is an abstract of a paper to be given at the American Management Association Conference on How to Plan Products That Sell, Jan 13-15, in New York City.



Dial a hole in a jiffy. Micrometer front operated back and side gauges provide instant gauging.

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The new Di-Acro 4 Ton Turret Punch Press provides rapid, close tolerance punching of round, square, oval and rectangular holes from $\frac{1}{16}$" to 2".

Rotating turrets provide rapid indexing for single or sequence punching. Precision hole location quickly obtained with Micro-twin gauges. Punches sheet metals up to 16 gauge mild steel, fibreboard, asbestos, paper, cork, leather, rubber, plastic and other sheet materials.

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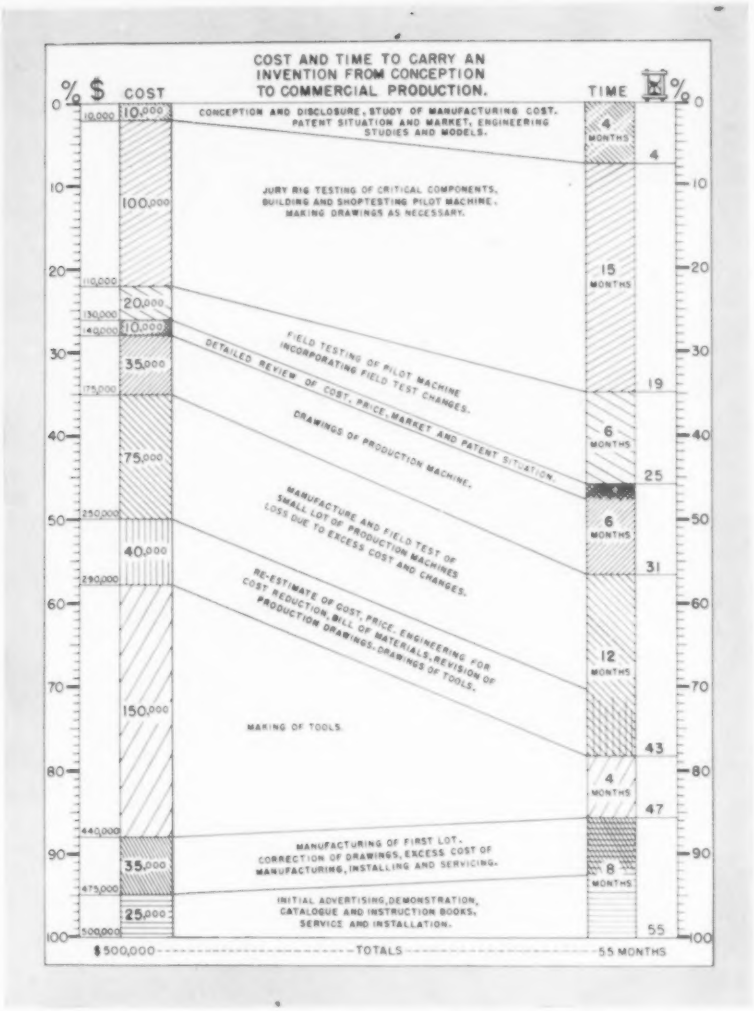

COST AND TIME TO CARRY AN INVENTION FROM CONCEPTION TO COMMERCIAL PRODUCTION.
% $ COST
TIME
CONCEPTION AND DISCLOSURE, STUDY OF MANUFACTURING COST, PATENT SITUATION AND MARKET, ENGINEERING STUDIES AND MODELS.
4 MONTHS
JURY RIG TESTING OF CRITICAL COMPONENTS, BUILDING AND SHOPTESTING PILOT MACHINE, MAKING DRAWINGS AS NECESSARY.
15 MONTHS
FIELD TESTING OF PILOT MACHINE INCORPORATING FIELD TEST CHANGES.
DETAILED REVIEW OF COST, PRICE, MARKET AND PATENT SITUATION.
6 MONTHS
DRAWINGS OF PRODUCTION MACHINE.
MANUFACTURE AND FIELD TEST OF SMALL LOT OF PRODUCTION MACHINES
LOSS DUE TO EXCESS COST AND CHANGES.
6 MONTHS
RE-ESTIMATE OF COST, PRICE, ENGINEERING FOR COST REDUCTION, BILL OF MATERIALS, REVISION OF PRODUCTION DRAWINGS, DRAWINGS OF TOOLS.
12 MONTHS
MAKING OF TOOLS.
4 MONTHS
MANUFACTURING OF FIRST LOT. CORRECTION OF DRAWINGS, EXCESS COST OF MANUFACTURING, INSTALLING AND SERVICING.
8 MONTHS
INITIAL ADVERTISING, DEMONSTRATION, CATALOGUE AND INSTRUCTION BOOKS, SERVICE AND INSTALLATION.
$500,000 TOTALS 55 MONTHS

NOTE: Figures and times are for a pioneer machine of medium complication, such as a high speed bread wrapping machine, selling for $10,000 to be manufactured in lots of 50 and having a total market of 2000 machines.

reasonable cost, the fraction inserted is 9/10. This evaluation is established for every known risk and then all such fractions are multiplied to find S.

In general, if X does not equal approximately 3 for a product close to the company's business and 5 or more in something rather remote, the project is probably not worth considering.

NEGOTIATING WITH INVENTORS

Inventors tend to be somewhat suspicious of corporations. Anything which relieves suspicion helps negotiations.

Inventors tend to put too high a value on their inventions. The remedy is a sense of values on the part of the corporate negotiator. Where significant facts are missing, allowance must be made for the possibility that the missing facts are adverse.

Do not narrow the company's future. Be stiff about agreements to keep the invention confidential, about grant-back clauses (particularly exclusive ones) and about agreements not to use or not to enter the same field for a period of time.

How is a fair royalty determined? The inventor must be paid out of the profits. He will be getting about one-third of the pre-tax income if the figure is 5%. This is probably about the top royalty for a profitable invention developed to a point just short of the going-business stage. **end**

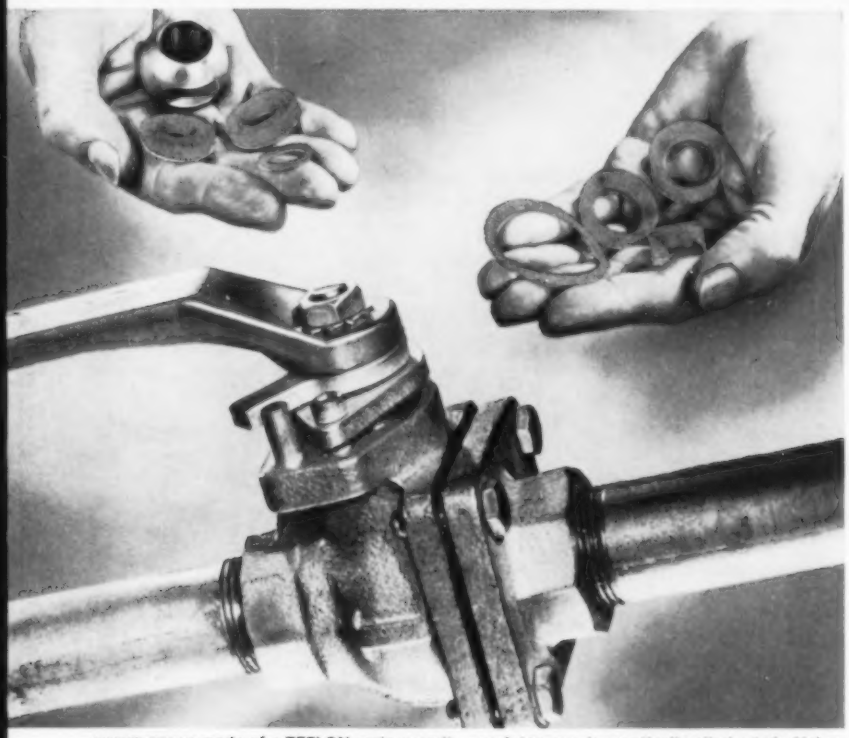
DU PONT

Better Things for Better Living ... through Chemistry

PRODUCT ENGINEERING NEWS

LATEST PROPERTY AND APPLICATION DATA ON

TEFLON® tetrafluoroethylene resins



VALVE SEALS made of a TEFLON resin permit easy opening or closing of ball valve under any pressure. Due to use of a TEFLON resin, no oil or grease is needed for lubrication, and maintenance is practically eliminated. (Valve by Rockwood Sprinkler Company, Worcester, Massachusetts.)

Seals of TEFLON® tetrafluoroethylene resins eliminate lubrication ... cut maintenance

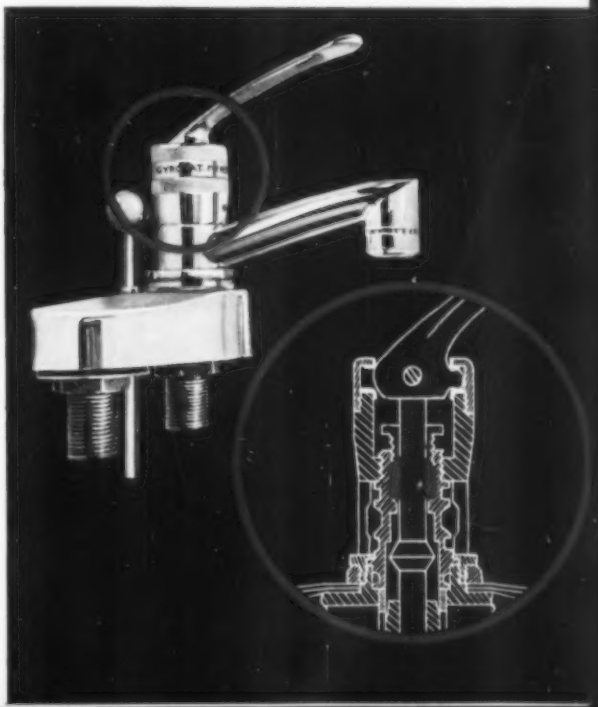
Designing a ball valve which needs no lubrication was made possible by utilizing seals molded from a TEFLON tetrafluoroethylene resin. Designing with TEFLON resins also allows minimum maintenance of the valve, since the seals are tough and durable and resistant to any chemical or corrosive that can be handled by the valve's stainless steel body. The extremely low coefficient of friction of TEFLON resins makes the valve quick-operating with no tendency to stick. Its design, with the ball forced against a seal of the resin by spring pressure, assures a drip-tight closure even at low pressures.

TEFLON resins are rated for use at temperatures to 500°F. Chemically, they are among the most inert materials known to science. Parts made of TEFLON resins are tough and durable. So outstanding are these resins as sealing and gasketing materials, that their use is often specified even where their exceptional heat- and chemical-resistance are not required. In particular, TEFLON resins are used for *extra safety* and *reliability*.

Packing gland of TEFLON® tetrafluoroethylene resins improves assembly and performance of new mixing faucet

A packing made of a TEFLON resin permits smooth rotation and easy up-and-down motion, yet prevents any seepage of water through the stem of this faucet. It can be assembled into the valve very easily, quickly and efficiently, and the adjustment on the packing can be uniformly pre-set by machine. This increases production, saves money in assembly and virtually eliminates packing replacements in the field. (Faucet by Gyro Brass Mfg. Corp., Westbury, L. I., N.Y.; parts molded of TEFLON tetrafluoroethylene resins by Sparta Mfg. Co., Dover, Ohio.)

WRITE FOR DETAILS on how to use Du Pont TEFLON tetrafluoroethylene resins in your own designs; E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Room 361, Du Pont Bldg., Wilmington, Del.
In Canada: Du Pont Company of Canada (1956) Limited, P. O. Box 660, Montreal, Quebec.



TEFLON® *is a registered trademark*

TEFLON is Du Pont's registered trademark for its fluorocarbon resins, including the tetrafluoroethylene resins discussed herein. This registered trademark should not be used as an adjective to describe any product, nor should it be used in whole, or in part, as a trademark for a product of another concern.

Watch the "Du Pont Show of the month"—90 minutes of the very best in live television—CBS network

THE QUESTION:

Who Owns the Results of Basic Research Underwritten at a University?

DR. D. J. GIRARD
Manager, Metallurgical Research
& Process Control (Steel & Tube Div.)
Timken Roller Bearing Co.
Canton, Ohio

"Mutual benefits will result . . .

if the ownership of basic research underwritten at a university by an industrial sponsor is judged on the basis of public good, and the best interests of the university and the industrial organization sponsoring the basic research program.

"In general, these interests may be best served by:

"1. Allowing the university to maintain ownership of information developed or patents generated on noncompetitive basic research sponsored by a single or multiple company arrangement. In such cases it has been customary to acknowledge the financial assistance.

"2. Allowing the sponsor to maintain control of information and patents resulting from basic research of a competitive nature.

"I am sure that both the university and company ownership will be exercised to the ultimate good of the public."

"In the year 1 A.S. . . .

(after Sputnik) this question is becoming more and more important. Although this may be heresy, coming from private enterprise which supports basic research at universities, it should be universally accepted that a university which gets results from its basic research owns the rights to those results.

"Universities are fundamentally operated to stimulate individuals in the learning process, and to encourage them to mature mentally. They provide facilities, guidance, and atmosphere to nurture these objectives. When in the course of a basic research project a result is obtained which may have important implications to the world, it is apparent that this result is no more than a manifestation of the success of the university in accomplishing its goals.

"Therefore, whether results are obtained by a student, professor, or group, and regardless of who underwrote the costs of the research, the basic ingredient which led to the result was the university. The individuals involved in obtaining the result profit immeasurably in personal recognition (of major importance to scientists and scholars, particularly); it is unfortunate that the university seldom profits in a tangible sense.

"If this thesis of university ownership of the results of basic research were more widely accepted, it appears that two serious national problems might be at least partially solved:

"(1) With results legally protected, a university could license industry to use its ideas and become financially independent of contributions, endowments, and state legislatures; and

"(2) With a 'financial independence' incentive, a university would have both greater desire and more money available to stress basic research in its curriculum."

T. P. EVANS
Director of Research and Development
Engineering Div.
American Machine & Foundry Co.

OF VIEW

"There is no ownership . . .

of the results of basic research. In time of peace, universities insist on the prompt publication of all results of basic research so that it may be shared by investigators everywhere. Other research organizations, whether organized on a profit or nonprofit basis, usually follow the rule.

"Sometimes a new discovery in basic research makes possible a new useful device or process, which may be patentable. But the development of that device is no longer basic research. The original investigator on the basic problem, if he happens to have made a new discovery which lends itself to application and if he happens to be smart enough to realize the possibility of the application and how to develop it, does have a few months' advantage over others in that he knows the new facts a few months before they are published. An outside organization sponsoring basic scientific research at a university can have this same advantage if it keeps in close contact with the university."

J. C. BOYCE
Academic Vice-president
Illinois Institute of Technology

ORAM C. WOOLPERT, M.D.
Executive Director
Ohio State University Research Foundation

"There can be only one answer . . .

the public and mankind in general. Combining the concepts of "basic research" and "a university" leaves no tenable alternative.

"To permit restrictive ownership of the results of such research, however underwritten, would stifle further exploration. It would be repugnant to the scientist and out of character for his institution.

"No individual, no corporation or state would find it advantageous or even feasible, in the long view, to monopolize fundamental knowledge, let the applications fall where they may."

"We welcome corporation support . . .

of research, but normally do not take on specific tasks for specific companies. In no case does a sponsor have control of the publication of information, and in no case does a private sponsor become the owner of any patents that may result. He may receive a non-exclusive license, but only in the case of the government is this issued on a royalty-free basis.

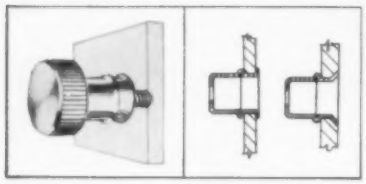
"When one of our scientists has an idea for a research program on which he wishes to work, he may seek financial support from companies, individuals or the government.

"Not including government contracts, we receive about $2 million annually in grants from individuals and corporations who believe in the progress of science and are willing to support it; and who believe that scientific progress will benefit their companies in the long run."

Dr. L. A. DuBRIDGE
President
California Institute of Technology

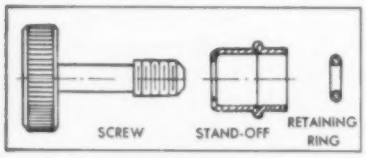
SELECT CLOSURE HARDWARE TO IMPROVE UTILITY, APPEARANCE, AND TO LOWER COST

QUICKLY INSTALLED SOUTHCO CAPTIVE PANEL SCREWS END MISALIGNMENT PROBLEM . . .



Simplicity of design contributes to clean, distinctive appearance and fast, low-cost installation. Stand-off is slipped into panel hole and secured by flaring. Screw is passed through stand-off and made captive by vinyl o-ring.

"Floating" screw design eliminates costly close tolerance manufacture and permits easy engagement regardless of panel distortion encountered under adverse use conditions.



SPECIFICATIONS

Material: Screw is brass, chrome plated; can be supplied in stainless steel. O-ring is vinyl plastic.
Overall length of screw: 1 3/16"
Depth of screw head: 1/4"

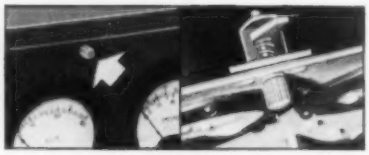
Sizes:

SCREW HEAD DIAMETER	THREAD SIZE
3/4"	1/4-20
5/16"	1/4-20, 12-24
7/16"	10-24,10-32

Length of thread: 3/8"

Screw head is supplied plain, as shown, or slotted for screw driver.

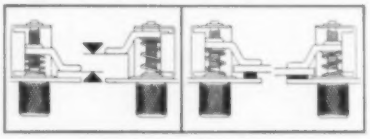
PRE-ASSEMBLED PAWL ADJUSTS TO DESIRED THICKNESS AND PRESSURE



This neat, compact Southco panel and door fastener is supplied assembled, requires but two rivets or bolts for low cost installation. It is available in three models—large, intermediate and midget.

The unique feature of Southco Pawl Fasteners is the fact that, by merely turning the knob, the pawl is adjusted to a wide range of frame thicknesses. This assures a tight grip without precision setting regardless of variations in frame or door dimensions or changes that are produced by wear or warping of sheets.

Pressure exerted by the pawl on the frame is controlled in the same way, by merely turning the knob. Against gasketed frames, pressure can be easily applied to compress the gasket.

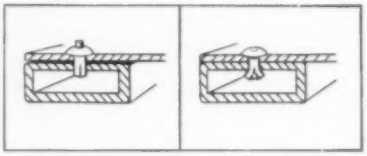


SPECIFICATIONS

Knob: Cadmium or chromium plated steel.
Head Styles: Protruding ribbed or knurled knob; flush screw driver slotted for large size only.

	LARGE	INTERMEDIATE	MIDGET
Knob diameter	7/8"	5/16"	1 1/32"
Total width	2 1/2"	1 3/4"	1 1/8"
Total height	1 5/16"	7/8"	25/64"
Back of panel depth	1 23/32"	1 1/4"	7/8"
Knob length	1 1/8"	15/16"	9/32"

FAST, HAMMER-DRIVEN BLIND RIVETS CUT INSTALLATION TIME



You "hit-the-pin" and the rivet's in. No special tools to limit production or require maintenance, no bucking, no finishing. For blind or open applications, Southco Drive Rivets save time, reduce costs.

Automatic "pull-up" action assures uniform, tight grip.

Southco Rivets are made of aluminum or cadmium plated steel with cadmium plated or stainless steel pins. Diameters are from 1/8" to 1/4", grip range is from 1/16" to 3/8".

Increased widespread use is due to low installed cost and elimination of down time and maintenance associated with fasteners requiring special tools.

FREE!

Fastener Handbook

Send for your free copy of Handbook No. 7, just released. Gives complete data for designers on these and many other specialty fasteners. 52 pages, in two colors.

Write on your letterhead to Southco Division, South Chester Corporation, 236 Industrial Highway, Lester, Pa.

SOUTHCO FASTENERS
LION

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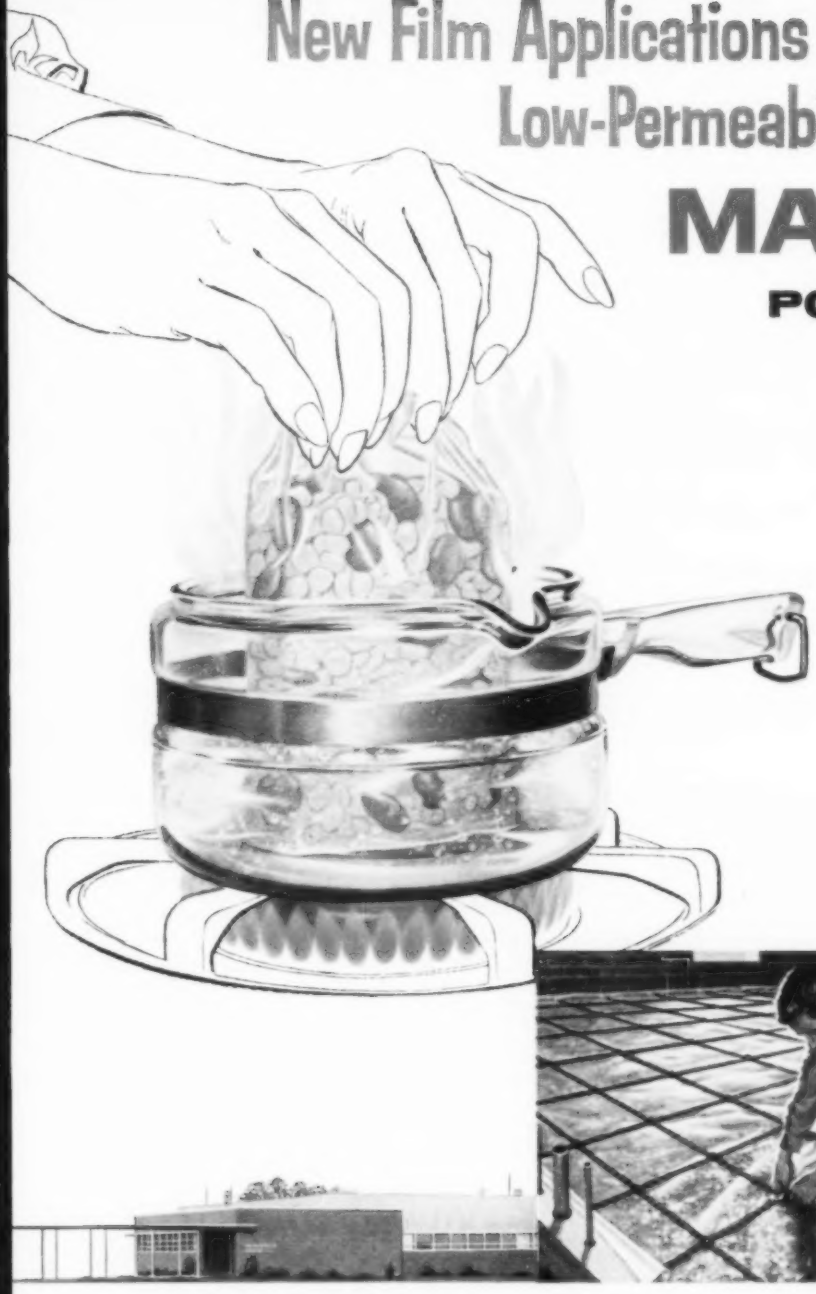
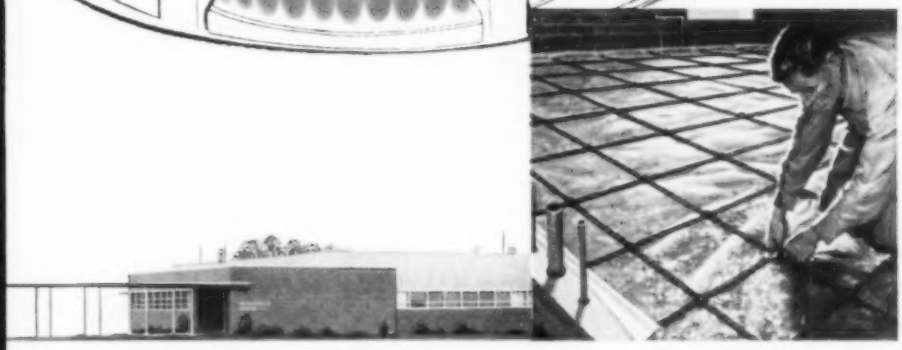
New Film Applications with Low-Permeability, Heat-Resistant MARLEX* 50 POLYETHYLENE

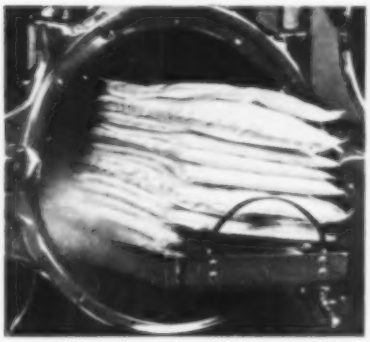


Liquid-tight pouches made from MARLEX 50 film are ideal for packaging foods or industrial products that are oily, wet, frozen or hygroscopic. Foods can be boiled in flavor-sealed MARLEX 50 packages. MARLEX 50 film is impermeable to moisture and most chemicals, and new extrusion techniques yield film with the burst strength and clarity of conventional polyethylene film.



New Sales Service Lab at Bartlesville is completely equipped with latest commercial processing machinery and research apparatus, including environmental test chambers. Phillips experienced technical service staff will assist you in developing new products and processes using MARLEX plastics. Please make arrangements through your local MARLEX sales representative.

High strength and resistance to heat, cold and moisture adapt MARLEX 50 film to many industrial and agricultural services . . . for moisture barriers in building and highway construction, garment bags, drum and carton liners, protective and insulating tapes, high-altitude balloons . . . pond liners, irrigation ditches, mulch, greenhouses, silo caps and liners, protective covers, etc.



Sterilizable MARLEX 50 film is suitable for packaging drugs, medical supplies and instruments . . . covering operating tables . . . and many other hospital uses. Controlled orientation in processing yields a tough, clear, heat-shrinkable film. Excellent stiffness and slip and non-blocking characteristics make MARLEX 50 ideal for use in high-speed packaging applications.

*MARLEX is a trademark for Phillips family of olefin polymers.

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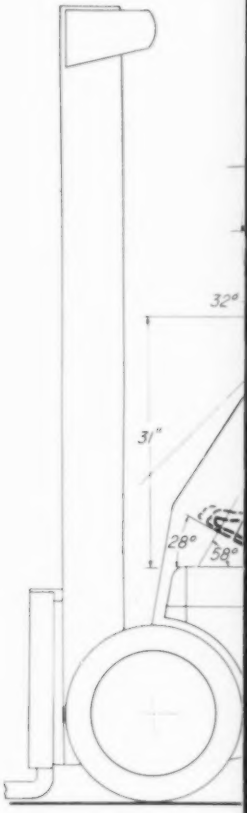
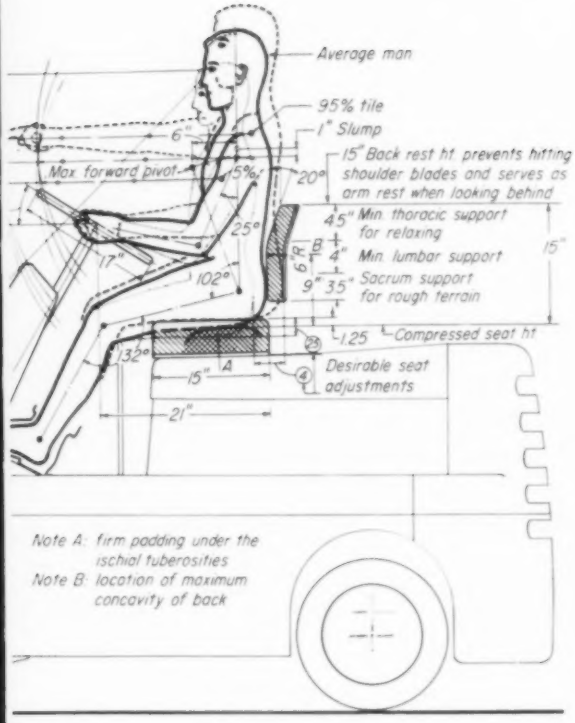
TRENDS



BROAD, BLACK BAND on new crane and earlier fork lift emphasizes low center of gravity and maintains family resemblance throughout Hyster line designed by Henry Dreyfuss.

in appearance design...



SEATING HUMAN BODY for operating machine with minimum fatigue depends on concentrating weight on two bony points in the buttocks, roughly 4½ in. apart, according to industrial designer Henry Dreyfuss. This is done by using a firm, flat cushion in new seat developed by the New York designer for Hyster Co, in consultation with Dr. Janet Travell, Cornell Medical College. This contrasts sharply with bucket seat concept, popular in sport cars and said to distribute body weight over areas ill-suited for the job. Seat length is held to a minimum, based on measurements of 95% of adult male and female population (see drawing above.) Shorter length, together with slight downward curve of seat and softer forward padding, minimizes interference with nerves and blood flow in thighs. Seat's back is curved for maximum support to lower back when erect posture is required. Support for middle of back is also provided, for more relaxed posture during waiting periods. Seat assembly was developed as a unit (see photo of mock-up) and is adjustable by means of a knob along an inclined plane to permit optimum angles at joints regardless of size or sex of operator. Available on Hyster equipment, including crane and fork lift shown on opposite page.

motivation research:

What's in it for you?

ANNESTA R. GARDNER
Associate Editor

Passing fad? Advertising gimmick? Or a valuable new technique to guide product design? Here are facts to help you make your own decision.

What makes people buy? How can they be encouraged to buy more? Would a new design make the sales curve start climbing?

These are questions every engineer asks. Often, he can answer them too. But in many cases, he'd like more evidence on which to base his decisions. Motivation research, its proponents claim, can give him that aid.

What, then, is motivation research? Basically, it's an extension of market research that tries to uncover the underlying reasons why people like and dislike certain products—reasons which the people themselves may not fully realize.

It is this attempt to find and influence basic attitudes that has earned motivation researchers the title of "hidden persuaders," a title of which they are not entirely fond.

M-R is defined by Lyndon O. Brown, vice-president of Dancer-Fitzgerald-Sample, as "research devoted to getting the best possible answers to the question, 'Why do people behave as they do?' "

The Institute of Motivational Research says the object of M-R is to "define consumer attitudes regarding a product or service . . . and to establish the root causes of such attitudes; to measure their commercial advantages or disadvantages; and to suggest . . . necessary improvements or new departures . . . which will lead to increased sales."

For example, ask most people why they want an automobile, and they'll say "for transportation." If that were so, the vehicle providing most efficient transportation would be the one they would buy. As everyone knows, that isn't exactly the case. Efficiency of operation is only one of many characteristics a prospective car buyer considers, consciously or unconsciously. What, then, are his motivations? A recent study was made by DuPont's Petroleum Chemicals Division of "the emotional factors governing the average motorist's ownership of a car and his choice of a service station." It came up with this answer:

"The average motorist owns and uses an automobile to satisfy one or more of the following needs:

"**The Play Need,** or necessity to relax and amuse himself, and seek diversion and entertainment.

"**The Aggression Need,** defined as the desire to prove one's superiority over another person.

"**The Conservance Need,** involving the need to collect, repair, and preserve things—to take care of the car, and to protect his investment.

"**The Infavoidance Need,** the desire to keep others from thinking that one is inferior in position, qualities, or taste; to void failure, shame, and ridicule." This four-syllable word, coined by DuPont, should not be confused with mere *inferiority complex*. "The motorist doesn't feel precisely inferior; he wants to avoid having others think he is inferior." Infavoidance, DuPont reports, "led all other factors in influencing the motorist's need for auto polish."

SPARK PLUGS VS POLISH

In contrast, spark plug purchases apparently hinge upon satisfaction of the Aggression Need; while Play and Aggression were found to be about equally important in a motorist's choice of gasoline.

These basics may not, however, be the only factors that combine to give a customer his final shove, DuPont notes. They influence his perception and conception of a product. But this perception is, in turn, influenced by such persuaders as previous experience, anxieties about product quality, opinions of family and friends, and advertising and promotion.

Most M-R studies so far have concentrated on the consumer field. But industrial studies are coming along. For instance, a motor manufacturer posed the question, "Why don't more engineers specify dc motors for more products?" There seemed to be many applications in which dc motors could be used—and weren't.

To answer the question, the company first turned to its advertising agency. Here, a market-research study showed that one major reason was the mistaken impression that dc motors could be used satisfactorily only where dc line power was available. But this did not seem to tell the whole story. The agency recommended an M-R investigation, involving "depth interviews" with engineers who weren't specifying dc motors.

This study found a good many engineers associated

dc with the past: "It is considered in context with early efforts to produce power." These engineers, then, feel that they will be old-fashioned if they specify dc motors. The M-R group recommended a major campaign to overcome this impression, pointing up the modern characteristics of dc motors by descriptions of new dc products for automation; and showing via case histories that "the new user of dc equipment gains stature by keeping up with industry leaders."

Neither the motor nor the auto study recommended redesigning the product. They were concerned with reasons for buying. But anything which could reinforce the "modern" idea on dc motors (new materials, restyling, and the like) should help broaden their sale; and anything which could help car users satisfy one of their basic needs should be welcome on cars.

HOME AND HARDWARE

As typical of a study that did influence product design, motivation researchers cite this case:

A manufacturer of locks and other building hardware, noting a trend to lighter, slimmer-lined home furnishings, decided to redesign his products. But first he decided to check on the basic factors in home-buying as well as in selection of building hardware. An M-R investigation into home-buying changed his mind. It showed a major factor to be the desire for a solid, substantial base; and substantial-looking hardware played a major role. Changing to a slim design might well have decreased sales—of homes as well as hardware.

Such recommendations seem straightforward enough. But the trouble, to many people, comes when the experts dip into socio-psychological jargon. Maybe this is only a passing phase—a demonstration of "shock treatment" to promote a new idea.

More serious, perhaps, is the matter of the techniques used for motivational research. M-R takes advantage of the usual survey and statistical methods, but it places special emphasis on the "depth interview." Indeed, many consider this a distinguishing characteristic.

This depth interview as its name implies, is an exhaustive investigation of the subject's thoughts, attitudes, and beliefs. It aims at uncovering his "hidden" or subconscious reasons for liking or disliking, wanting or shunning this or that.

PROBE THAT DIGS IN

As might be expected, the psycho-probing is a lengthy process—usually taking an hour or more. So it's likely to be expensive, and even for a major study the number of probes may be held to 50 or less. Even if the interviews are supplemented by a broader survey, the conclusions may still be open to question: Just who are these guinea pigs? How well do they represent the "population" or group from which they are chosen?

Nevertheless, M-R has admittedly come up with useful suggestions—suggestions which might have been "obvious" but which, in fact, had not previously been considered or given sufficient weight.

ONE TECHNIQUE—MANY TECHNICIANS

Where does this leave M-R? It turns out to be an extension of market research, with special emphasis on one technique—the depth interview. It is not a completely new idea, and it does not represent the last word or the final answer on product development.

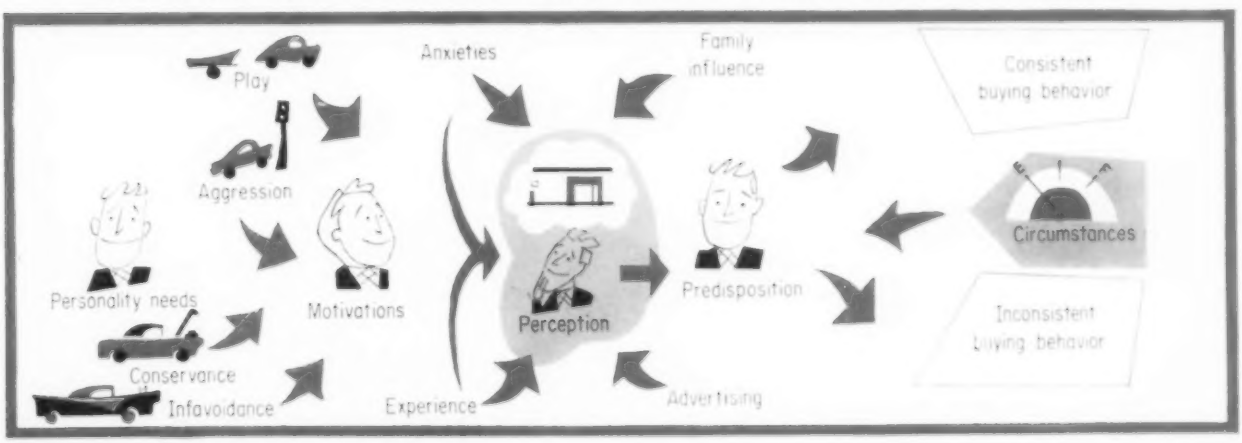
On the other hand, devotees obviously believe it can provide new directions for product design and promotion. On that basis, at least, it's worth investigating.

The literature on M-R is already reaching staggering proportions. Magazine articles, books, speeches and reports are available in quantity. (The DuPont report mentioned above is obtainable from the Petroleum Chemicals Div., Wilmington 98, Del., and its sales offices across the country.)

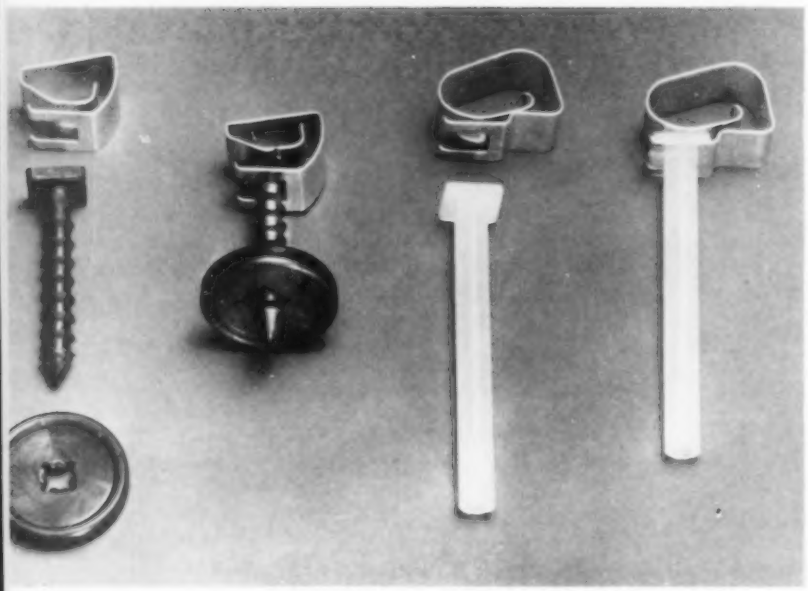
Advertising agencies are a primary source of information on M-R. Many of them helped pioneer it.

Finally, as might be expected, there are several consultants who now specialize in motivation research, among them: Institute for Motivational Research; James M. Vicary; and Social Research, Inc. **end**

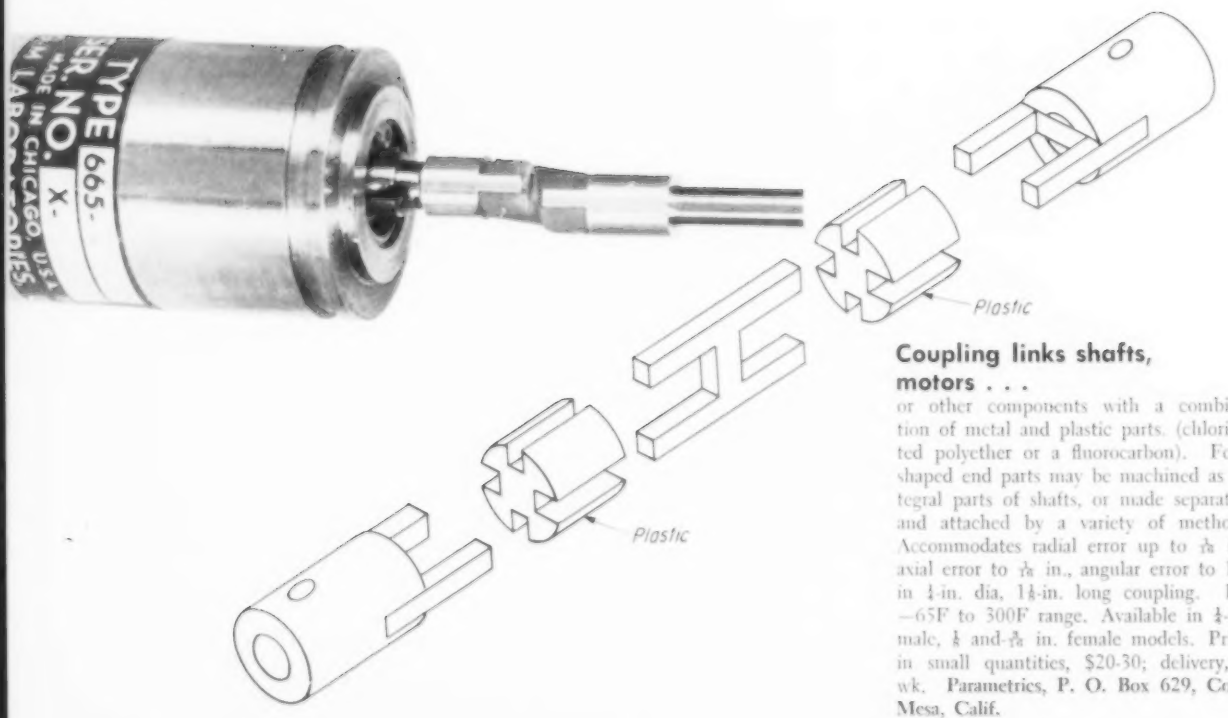
Buying patterns are influenced by outside factors (to right of large arrow) as well as by basic motivaitons (left). Both groups of factors, Dupont says, contribute to the buyer's perception of a product, and play a role in his final decision.



SIGNIFICANT PARTS

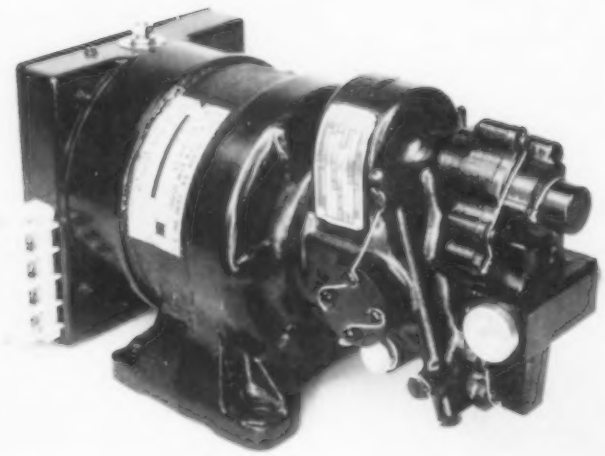


Serrated polyethylene studs . . . were originally designed to secure glass-fiber insulating batts (up to 2½ in. thick) aboard air transports, reducing weight and assembly manhours. Studs snap onto stringers, butt is impaled and removable washer pushed into place. Another stud design (nylon) for holding stiffer, thinner members, also shown, is drilled and tapped for retaining screw. $14.50 per 1000; delivery, 2 wk. **Monadnock Mills, Div. United-Carr Corp., San Leandro, Calif.**



Coupling links shafts, motors . . . or other components with a combination of metal and plastic parts. (chlorinated polyether or a fluorocarbon). Fork-shaped end parts may be machined as integral parts of shafts, or made separately and attached by a variety of methods. Accommodates radial error up to 1/16 in., axial error to 1/16 in., angular error to 15° in ¼-in. dia, 1⅛-in. long coupling. For —65F to 300F range. Available in ¼-in.-male, ⅜ and-7/16 in. female models. Price, in small quantities, $20-30; delivery, 6 wk. **Parametrics, P. O. Box 629, Costa Mesa, Calif.**

MATERIALS · EQUIPMENT



Hydraulic motor generates electricity . . . in this emergency 400-cps unit rated at 4 kva with 100% permissible overload. Can be used as an accessory powered by a hydraulic system, pumping unit, or other source of fluid power. Hydraulic motor is rated at 12,000 psi; torque is 108 in-lb at 3000 psi. Price and availability information not obtainable. **Sundstrand Aviation, Div.Sundstrand Machine Tool Co., 2421 11th St., Rockford, Ill.**

Measurement-by-weight . . . of liquids, powders or granular solids is accomplished automatically by a device based on a cone-shaped weight-tank mounted on a beam, with an adjustable counterpoise. A pneumatically actuated flow valve permits material to flow into tank at high rate until preset weight is approached, at which point flow is automatically diminished to obtain accurate measurement. Weighing range is 1 oz to 10 lb; output, up to 10 lb per min. Approx $750 (with stainless contact parts); delivery, 6 wk. **Glengarry Processes Inc., Bayshore, N. Y.**

Glass-encased relay . . . is hermetically sealed and can be actuated by transistor, magnetic amplifier or solar cell, in equipment such as current or voltage indicators, variable time delay, fail-safe monitor. Actuating voltage is 0.4 to 0.5 v (operation differential 0.02v) and component parts will withstand as much as 1.5 v. List price is $6.50; $3.25 over 500. Available from stock. **Hamlin, Inc., 1316 Sherman Ave., Evanston, Ill.**

High temperature grease . . . withstands temperatures to 600 F and protects metal parts running at speeds to 30,000 rpm. Lubricants contain an organic vat dye thickener to improve heat stability and gelling efficiency. Developed for application in missiles and supersonic planes. Lubricant class includes ETR Grease B and Grease D (see DTW, Product Engineering, Dec. 9, 1957, p. 9) $38 per lb; almost immediate delivery. **Shell Oil Co., 50 W. 50th St., New York 20.**

Varying orifice contour . . . provides flow accuracy said to approach ±1%, at any pressure range up to 1000 psi and at flow rate of 0.5 to 11 gpm. A spool and sleeve in the line of flow move in relation to each other to provide orifice contour required for even flow rate, compensating for upstream variations in pressure. Suitable for fluid lines, hydraulic and pneumatic circuits operating within −65 F to 400 F range. Price and delivery information not obtainable. **Conair Inc., 731 W. Wilson Ave., Glendale 3, Calif.**

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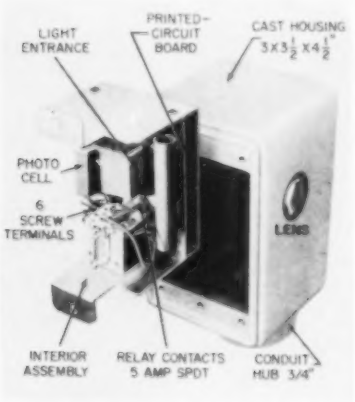
SIGNIFICANT PARTS MATERIALS EQUIPMENT . . .

Miniature high-torque screws . . . are available in sizes as low as No. 2-56. Features a recess that gives positive gripping to driver and prevents slipping damages to adjacent electronic components during assembly. Screws are reusable and are made in ferrous and nonmagnetic metals for special electronic devices. Screws will not burr. **Voi-Shan Mfg. Co., Div. of Pheoll Mfg. Co., 8463 Higuera St., Culver City, Calif.**

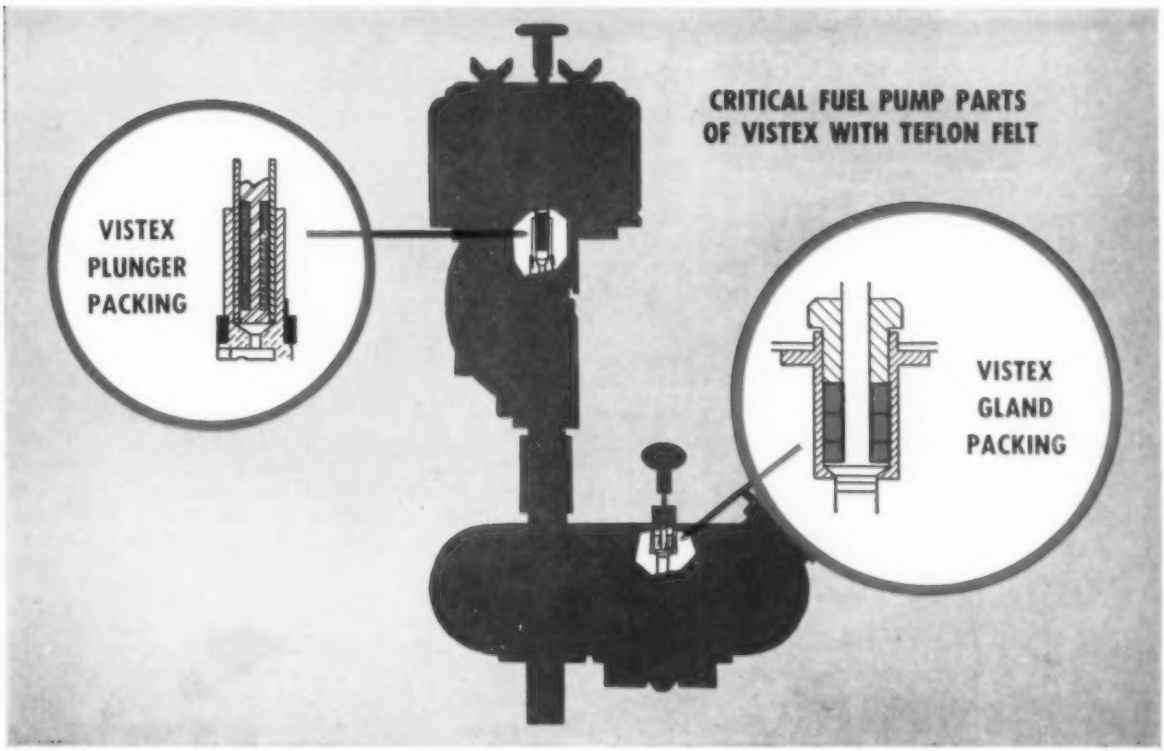


Photorelay . . . is comprised of a printed-circuit board held in a sheet metal cradle that fits into a conventional conduit box of one-gang type. Board contains all parts on one side; etched wiring on reverse face. Eliminates amplifier tube, warmup delay, internal heating. Operation is from 100 to 130 v, 50/60 cps. Control is from about 10 ft-c of light into lens. Withstands weather, dirt, vibration, shock, temperature, humidity and voltage fluctuation. **Photobell Co., Inc., 43 Vesey St., New York 7.**

Push-pull magnetic grid drive . . . for servo applications is package unit, measuring 2⅜ x 2¾ x 3¾ in. The full-wave, medium-gain thyratron grid drive, incorporating fast-response magnetic amplifier, provides a servo amplifier for power levels to 15 kw when used with appropriate thyratrons. Has linear proportional control, full 180° range of firing angles, inherent noise filtering, automatic compensation for line-voltage variations, elimination of variations caused by aging or tube replacement. Among applications are reversible motor drives for numerical control of machine tools; electronic reversing of three-phase induction motors and speed control of clutch-and-brake ac motor drives. **Fairfield Engineering Corp., 934 Hope St., Springdale, Conn.**

VISTEX WITH TEFLON FELTS

for positive . . . self-lubricating seals



Are dependable seals your problem?

Here's a *new* way to solve even the toughest ones . . . *American's Versatile Vistex-with-Teflon Felts!*

Felted of Teflon reinforced synthetic fibres, these advanced-type, self-lubricating Felts are setting new performance standards under both high and low temperature operating conditions. They resist *all* acids, alkalis, aliphatic and aromatic compounds . . . maintaining their thermal stability in applications up to 420° F!

You get better, stronger seals . . . Vistex-with-Teflon Felts withstand up to 5,000 psi . . . eliminating troublesome lateral plastic flow and sealing on polished or irregular surfaces with only minimum pressure.

Vistex-with-Teflon Felts can be precision cut without ravelling or fraying . . . having a *very* high tear value. Due to their great strength they are reusable for *even* greater economy.

Available in 36" x 36" sheets with thicknesses of 1/16", 1/32", 1/64" or as cut gaskets, strips and washers . . . quality Vistex-with-Teflon Felts can economically and efficiently meet your specific requirements.

Save time—consult our engineering staff for assistance in choosing the correct Felt. Remember: It's the largest, *most* experienced staff in the industry . . . and it's backed up with the largest, *most* modern laboratory facilities in the industry.

Write today for technical Bulletin VT-2-856 . . . on your company letterhead, please.

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In addition to Teflon, Vistex Felts are also impregnated with such polymeric compounds as:

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. . . to meet individual chemical and physical conditions.

Shouldn't you investigate the advantages of these Felts, too? They are already being used in thousands of difficult applications throughout every major industry.

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If you buy galvanizing—or if you have a product that can be improved by galvanizing you can get galvanic protection against rust and rust creepage via Z.R.C. for as little as 1½¢ per sq. ft.

And because Z.R.C. is easily applied by brush or spray you can galvanize iron or steel surfaces of any size anywhere. And this galvanizing can be done by your own people—a self contained operation!

Z.R.C. is a free-flowing compound consisting of 95% pure zinc—dries quickly to a tough, flexible, firmly adherent coating—can be built up to any thickness. No special mixing or surface preparation is necessary. Protection begins on contact and lasts (Z.R.C. will withstand over 3000 hour salt spray testing). For prices, details and ordering information . . .

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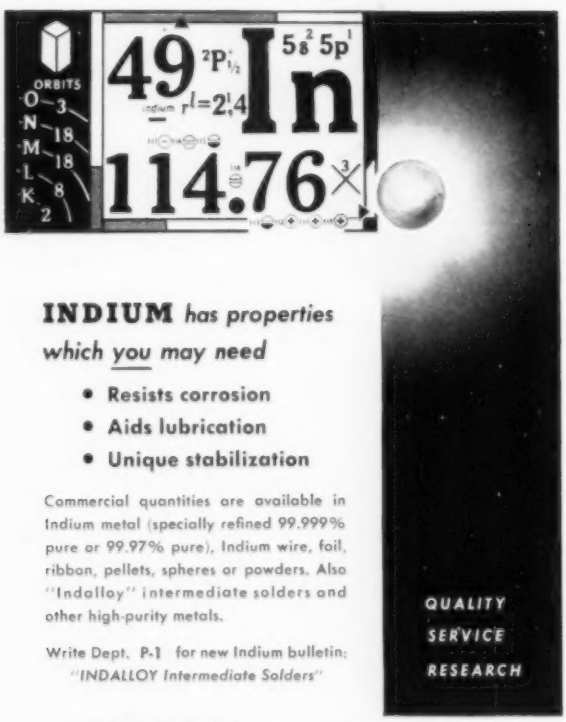

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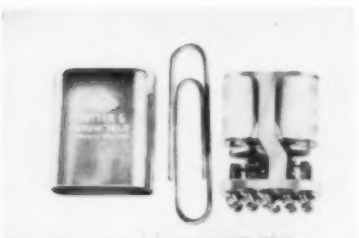
Overload relay . . .

gives full three or two-phase protection without using additional space and permits final and accurate field adjustments to exact motor loads. Accurate response over a range of about 25% of the motor current at temperatures from —11.2 to 131 F is assured by directly heated bi-metal elements that are not materially affected by normal ambient changes. Thermal elements for normal, quick or slow trip can be furnished. Normally adjusted for manual reset, the relay can be changed to automatic reset at the factory or in the field. Contacts are SPDT, normally closed, for controlling the contractor, and normally open to control another circuit, such as an alarm system. **Rowan Controller Co., 2315 Homewood Ave., Baltimore 18.**



Magnetic latching relay . . .

operates on a 1 w, 3 millisec pulse to either of two coils and features high shock and vibration resistance. Magnetic latch and high contact pressures hold contacts closed under 100-g shock and 30-g vibrations to 2000 cps. Switches loads to 2 amp at 30 v dc resistive or 1 amp at 115 v ac resistive. It is 0.875 in. high x 0.795 in. wide x 0.359 in. deep and operates in ambient temperatures from —85 to 257 F. Can be mounted by brackets or studs. Equipped with plug-in headers or hook-end solder terminals for two No. 24 AWG wires. **Potter & Brumfield, Inc., Princeton, Ind.**

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Black as midnight . . . but more important, imported CASTELL *stays* black on your drawing without flaking or feathering, *stays* black when it faces the relentless light of the blueprint machine. The *blacker* the line the *sharper* the print.

With maximum graphite content and optimum granulations, there is no need to add foreign oily substances to give CASTELL the *illusion* of black. CASTELL is *born* black. Our exclusive microlet-milling reduces the particles to perfect size and consistency, gives you clean, sharp, extremely opaque lines that make hundreds of prints without losing their reproductive qualities.

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CASTELL LOCKTITE (with Tel-A-Grade Indicator) for those who prefer a feather-weight holder with degree indicating device. Grips the lead like the jaws of a bulldog to prevent slipping or turning. One hand push-button control reduces graphite stains.

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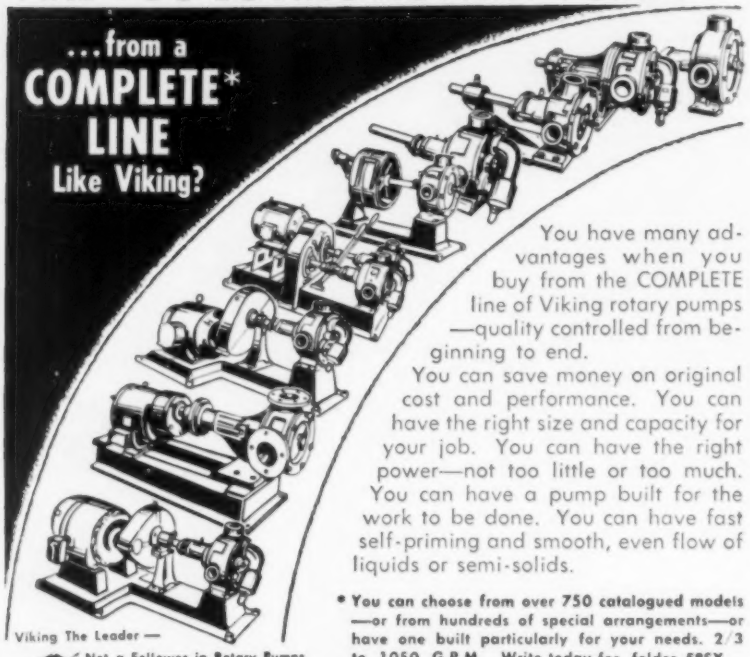

You have many advantages when you buy from the COMPLETE line of Viking rotary pumps —quality controlled from beginning to end.

You can save money on original cost and performance. You can have the right size and capacity for your job. You can have the right power—not too little or too much. You can have a pump built for the work to be done. You can have fast self-priming and smooth, even flow of liquids or semi-solids.

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- shapes suited to spinning
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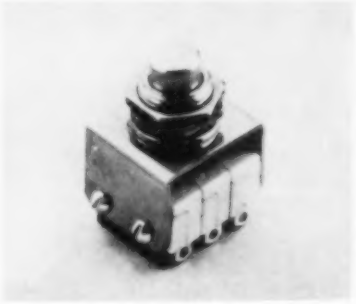
SIGNIFICANT PARTS MATERIALS EQUIPMENT . . .



Subminiature actuator . . .

operates three subminiature switches at the same time. Panel-mounted, overtravel plunger-type actuator assembly is 1 x 1¼ x ¾ in. Designed originally for equipment that measures vibration displacement of plant machinery. In tests, actuator demonstrated a high level of repeatability over several hundred thousand cycles. Switches, used with the actuator, are also available. They have minimum contact resistance capable of handling low voltage, milliamp circuits. Actuator assembly, including switches, is a standard item. **Acro Div., Robertshaw-Fulton Controls Co., Columbus 16, Ohio.**

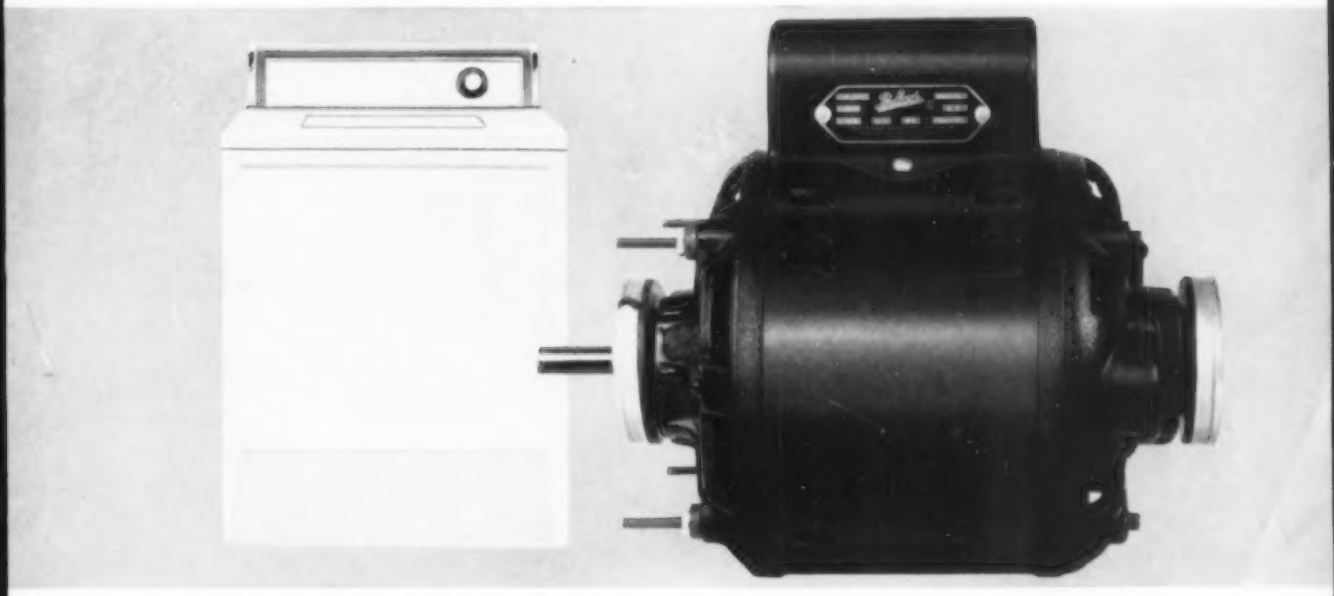
Flame-retardant laminate . . .

has electrical characteristics said to exceed NEMA values. Electrical and arc resistance properties are retained after exposure to high humidity or immersion conditions. It can be fabricated readily with hot-punching equipment. Suitable for high-voltage applications, for uses involving sliding contacts, and for riveted assemblies where low cold flow assures retention of spacing. Laminate has low water absorption and low edge and center expansion. **Richardson Co., 2765 Lake St., Melrose Park, Ill.**

Flame-retardant laminates . . .

come in nine different grades of varying characteristics for industrial applications. Resistance to heat and flame combines with high strength and electrical qualities inherent in laminated plastics. In addition to resin impregnation, laminates contain special chemical additives to dampen and extinguish flames started by electric arcs or other sources. Included in line are paper-base phenolic resin laminates, glass-mat polyester resin laminates and glass-base epoxy resin laminates. Materials are available in a wide range of thicknesses, sheet sizes and tube and rod diameters. **Continental-Diamond Fibre Corp., Sub. of Budd Co., Newark, Del.**

WANTED / *A way to wash all clothes automatically*



DELIVERED / *A Packard two-speed motor*

Either you wash light and heavy clothes differently, or you run the risk of ruining the delicate fabrics, or letting the heavy ones remain half-clean.

Mechanical speed-changers can help you solve this problem. But they're complicated, cumbersome and costly. However, until Packard Electric stepped into the situation, that was all there was.

Then, by working closely with washing machine manufacturers, and by drawing upon years of motor development and production experience, Packard Electric produced the first two-speed electric power unit for washers. It had just the right amount of speed, power and torque. And it gave Packard's customers a competitive plus that's being talked about throughout the industry.

Packard Electric's research, engineering and production teams have a long record of accomplishment in making custom-built motors work better in appliances. We'll help you solve special design problems, then deliver your motors complete with mountings and accessories to simplify your assembly procedures and lower costs. Investigate this opportunity now.

Packard Electric

Warren, Ohio

Division of General Motors

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SPECIAL REPORTS ON FINISHING NON-FERROUS METALS

NUMBER III—Lustrous, Corrosion-Resistant Finishing with Chemical Polishing Iridite®

WHAT IS IRIDITE®?

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a non-porous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

Chromate conversion coatings are widely accepted throughout industry as an economical means of providing corrosion protection, a good base for paint and decorative finishes for non-ferrous metals. Certain of these coatings also possess chemical polishing abilities that have luster-producing, as well as corrosion-inhibiting, effects on zinc and cadmium plate, zinc die castings and copper alloys. However, continued developments in this field have been so rapid that many manufacturers may not be completely aware of the breadth of application of this type of finish. Hence, this discussion of the many ways in which this chemical polishing characteristic can be used in final finishing or pre-plating treatments to produce a lustrous appearance with distinct display and sales appeal and appreciable savings in cost. Report I on decorative, corrosion-resistant finishes and Report II on paint base corrosion-resistant finishes are available on request.

The degree of luster possible on a surface is a function of the degree to which the surface can be smoothed. Leveling to provide a smooth surface can be achieved by mechanical or chemical means, or a combination of these, depending upon the luster desired and the original condition of the metal. Chemical polishing effectively imparts luster otherwise difficult and costly to obtain. For this reason, it is often used to supplement or entirely replace mechanical polishing, depending upon the application and the original condition of the metal. Chemical polishing has the additional advantage of providing overall treatment of the submerged part. It reaches into even the deepest corners and recesses that are otherwise inaccessible. Certain of the Iridites are specifically designed to perform this chemical polishing operation. Also, they provide corrosion protection as do all Iridites, thus may be used as a final finish or a pre-plating polish.

If Iridite is to be used as a final finish, in contrast to pre-plating treatment, the chromate conversion coating generated is allowed to remain, providing good corrosion resistance. Color inherent in these Iridite films ranges from a yellow cast to yellow iridescent. These coatings may be used without further treatment where this color is acceptable and good corrosion resistance is desired. Further, these basic coatings can be tinted by dyeing. Among the dye tints available are shades of red, yellow, blue and green. If desirable, the basic coatings can also be modified by a bleach dip leaving a clear bright or blue iridescent finish. In all cases bleaching reduces corrosion resistance.

As examples of this type of final finishing, Iridites #4-73 and #4-75 (Cast-Zinc-Brite) make possible for the first time, lustrous chemical polishing of the as-cast surface of zinc die castings. Thus, in many cases, sizeable savings in finishing cost are realized by elimination of plating costs. This economical method can be used on tools, appliance parts, toy pistols, locks and many other small castings. Another example is the treatment of copper and brass parts, such as welding tips, to eliminate buffing and provide additional corrosion resistance. In many cases, handling costs are reduced appreciably by replacing piece-part handling with bulk processing. Still another example of the use of this chemical polishing and protective quality of Iridite is a simple system of zinc plate, Iridite and clear lacquer instead of more costly electroplated finishes. Typical of this type of lustrous finish are builders hardware and wire goods.

As a pre-plating treatment, in contrast to final finishes, Iridite can be used to chemically polish zinc die castings or copper prior to plating. In such cases, Iridite should be applied as an in-process step, so that the protective film is removed before the plating cycle. The savings in handling, material and labor costs are obvious. This process has made it practical to plate chrome directly over copper on steel, conserving nickel, yet producing a lustrous chrome finish. Used after stripping faulty plate in reprocessing zinc die castings, Iridite restores luster to the casting, thus making possible replating without blistering.

Other Iridite finishes are available to produce maximum corrosion resistance, a wide variety of decorative finishes and excellent bases for paint on all commercial forms of the more commonly used non-ferrous metals. As a final finish, appearance ranges from clear bright to olive drab and brown and many films can be bleached or dyed. As a paint base Iridite provides excellent initial and retentive paint adhesion and a self-healing property which protects bare metal if exposed by scratching. Iridites have low electrical resistance. Some can be soldered and welded. The Iridite film itself does not affect the dimensional stability of close tolerance parts.

Iridites are widely approved under both Armed Services and industrial specifications because of their top performance, low cost and savings of materials and equipment.

You can see then, that with the many factors to be considered, selection of the Iridite best suited to your product demands the services of a specialist. That's why Allied maintains a staff of competent Field Engineers—to help you select the Iridite to make your installation most efficient in improving the quality of your product. You'll find your Allied Field Engineer listed under "Plating Supplies" in your classified telephone book. Or, write direct and tell us your problem. Complete literature and data, as well as sample part processing, is available. Allied Research Products, Inc., 4004-06 East Monument Street, Baltimore 5, Maryland.

NEW LITERATURE

Natural Magick

JOHN BAPTISTA PORTER, a Neapolitan. *Reprint of an English printing in 1658, with a foreword and editing by Derek J. Price, Smithsonian Institution. Published by Basic Books, Inc., 59 Fourth Ave., New York 3.* 7x11, $7.50.

Giambattista Porta (1535-1615 approx) was apparently a child prodigy who grew up into a scientist of some note; he brought associates together in Naples in the first scientific society of our age. This society promptly was charged with dealing in the occult. Pope Paul V cleared the men, however, and they went on to combat the scientific ignorance of their day.

This volume, reproduced from the original English print, is essentially a translated record of the society's findings, plus Porta's own records, and questions about earlier "scientists." It is carefully subdivided into 20 "books," and all items are quite short. They cover subjects such as transmuting metals, counterfeiting gold, the loadstone (magnet), tempering steel, strange glasses (including ancestors of the bifocal lens, telescope and microscope), statics, and pneumatics. Proper tempering colors are here for saws, files, chisels, knives, armor, fishhooks, swords, scythes, and medical instruments, as well as details for making Damask blades. Other books describe strange cures, the beautifying of women, distillation, perfuming, artificial fires, plant production, invisible writing.

This is a book for the student and collector, one interested in the origins of our science. It is full of half-told half-truths, but can be dipped into almost anywhere with interest. It gives a picture of the age just preceding the 17th-century "scientific revolution," showing that giants of the revolution had a surprisingly large foundation of "facts" on which to begin building.

EJT

Technology and People

Abstracted from "Technology and People," by James T. O'Connell, U. S. Under Secretary of Labor, ISA Journal, Nov. 1957, 313 Sixth Ave., Pittsburgh 22.

The principle that technology is developed to secure and enhance the individual's happiness is termed not merely morally and philosophically correct, but "eminently practical" as well. In turn, changes in technology are described as changing the nature of work, which in turn causes changes in individual's skills.

How growth and change in American industry and technology has transformed and is continuing to transform the statistical division of labor is described. Although 10 million new people are expected to join the labor force between 1955 and 1965, giving these newcomers the better training required by new skills now being developed will require nothing less than maximum education and opportunity for every available person. Discrimination because of sex, color, religion, national origin or other reasons has thus become impermissible for practical reasons.

Impact of Automation

Abstracted from "The Impact of Automation," by editors of American Machinist, Oct. 21, 1957, 330 W. 42nd St., New York 36.

This report is an evaluation of automation published on the ninth anniversary of first use of the word in print—in *American Machinist*. A special survey of metalworking and interviews with scores of members of the industry formed the basis of the article's nine sections: (1) How much automation today; (2) What is automation; (3) Why does a company try automation; (4) How successful is automation; (5) How is automation planned; (6) Can Automation be flexible; (7) How does automation affect productivity; (8) Will research lead to automation; (9) What is the future of automation.

Reading and Recognition by Computers

The growing need for more effective means of exchanging information between humans and computer systems has developed several new approaches. Eyes, ears and voices for computers are the desired objectives of the work reported in these seven papers from the 1957 Eastern Joint Computer Conference, Dec. 9-13, Washington, sponsored by IRE, AIEE and ACM. Here are the titles: (1) Use of an IBM 704 in Simulation of Speech-recognition Systems; (2) An Automatic Voice-readout System; (3) Experiments in Processing Pictorial Information with a Digital Computer; (4) Optical Displays for Data-handling-system Output; (5) Devices for Reading Handwritten Characters; (6) Automatic Registration in High-Speed Character-Sensing Equipment; (7) The NCR High-speed Electromagnetic Printer.

POWER TRANSMISSION—Brochure, 4 pp, explains how rotary, linear or angular motion can be transmitted with precision and positive position indication. A number of applications are noted. Research Div., United Shoe Machinery Corp., 140 Federal St., Boston.

LABORATORY PUBLICATION—Quarterly. Highlights personnel, work, equipment of this lab, which specializes in molecular physics, chemical kinetics, chemical physics, solid-state physics, optics, and physical chemistry. To receive The Bulletin regularly, write to Anderson Physical Laboratory, 605 S. 6th St., Champaign, Ill.

HIGH-TEMPERATURE ELECTRIC FURNACE—Booklet 2152, 16 pp. describes physical properties of 23 furnace products, including zirconium, calcium, boron, silicon and other carbides, nitrides and oxides. Technical data is offered in tables. Discusses present and possible future uses, availability of sizes and quantities, and physical characteristics. Norton Co., Worcester 6, Mass.

SEALS FOR ROTATING SHAFTS—Brochure, 12 pp. Explains the principles of mechanical shaft sealing and describes and illustrates the basic components of such seals, with comment on possible solutions for different problems. Important basic applications are shown, with an acetate overlay detailing seal construction and position for each application. Rotary Seal Div., Muskegon Piston Ring Co., Sparta, Mich.

CORROSION RESISTANCE OF COPPER, COPPER ALLOYS—Booklet B-36R, 32 pp. A revised edition that includes latest findings. Includes a tabulation of relative corrosion resistance of the principal types of copper and copper-base alloys when in contact with 186 different corroding agents. Previous edition was published in 1953. American Brass Co., Waterbury 20, Conn.

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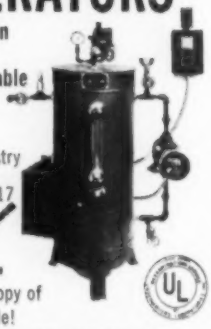

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22-24 **National Conference on Automation Systems** sponsored by Electronic Industries Assn., at Arizona State College, Tempe, Ariz. Sessions cover use of electronic systems in business and industry. For information contact the EIA Room 650, 11 West 42nd St., New York City

27 **American Society for Testing Materials,** conference for the proposed new four state district—New Mexico, Arizona, Utah and Colorado. For information contact J. L. Abbott, 1902 Richmond N. E., Albuquerque, N. M.

27-29 **American Society of Heating and Air-Conditioning Engineers,** Penn-Sheraton Hotel, Pittsburgh, Penna. Papers cover aspects of solar energy, panel cooling, dynamic heat storage systems, etc. For information contact W. M. Vidulich, 62 Worth St., New York 13.

28-31 **National Technical Conference,** Society of Plastics Engineers, at Hotel Sheraton-Cadillac, Detroit, Mich. Over a hundred papers will cover developments, methods, materials, and techniques in plastics.

29-30 **Midwest Welding Conference,** sponsored by Armour Research, Illinois Institute of Technology, and Chicago section, American Welding Society, at Illinois Tech Chemical Building, 3255 Dearborn St. For information contact Harry Schwartzbart, 10 W. 35th St., Chicago.

FEB.

4-6 **Society of the Plastics Industry,** Reinforced Plastics Div., Technical and Management Conference, Edgewater Beach Hotel, Chicago. For information contact the Society, 67 W. 44th St., NYC.

MAR.

3-6 **ASME Gas Turbine Power Div.,** Conference and Exhibit, Shoreham Hotel, Washington. Exhibits are limited to gas turbine power plants, component parts, material and accessories. For information contact ASME, 29 W. 39th St., NYC.

12-14 **Pressed Metal Institute,** Spring Technical Meeting, Sheraton-Cadillac Hotel, Detroit, Mich. For information contact the Institute, 3673 Lee Road, Cleveland, Ohio.

16-21 **4th Nuclear Engineering and Science Conference,** managed by American Institute of Chemical Engineers, with participation by ASME, AIEE, American Institute of Mineral, Metallurgical, and Petroleum Engineers at International Ampitheater, Chicago.

17-20 **ASME Aviation Division,** Conference at Statler-Hilton, Dallas, Texas. For information contact the Society, 29 West 39th St., NYC.

19-20 **ASME Committee on Management,** Conference at Somerset Hotel, Boston, Mass. For information contact the Society, 29 West 39th St., NYC.

24-27 **27th IRE National Convention** and Radio Engineering Show, Waldorf-Astoria Hotel and New York Coliseum. Program includes 275 papers covering fields of all 27 IRE professional groups. 850 exhibitors are participating in the show. For information contact E. K. Gannett, 1 East 79th St., NYC.

the proof of a metal
is a cast test bar

the proof of a casting
is the casting itself

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Publisher's Postscript...

Reading Pays Off

"One of my most troublesome problems," an executive engineer said to us recently, "is how to control the vast amount of printed matter that comes in every day addressed to members of the engineering staff. Magazines, bulletins, reports, catalogs . . . is it all really necessary?"

We reminded him that the field of product design and development is perhaps the fastest-moving segment of American industry. So much is happening almost everywhere, day after day, that only through the printed word can accurate and dependable information be made widely available. The engineer must be informed on a wide range of subjects—it's part of his job to keep up to date—and that requires a lot of reading.

Any company that attempts to curb engineers' reading, particularly of current technical articles and news, is doing itself considerable harm. Members of the staff who exhibit potential should be actively encouraged to read the engineering press—whether the reading is done at the office or at home. That such encouragement pays off in a big way is well illustrated by a number of former small companies that have grown big partly through encouraging such reading.

Just one illustration: A medium-sized company in the electrical field at the end of the war sent a memo to all its engineers and supervisory personnel in other departments to the effect that: "We believe it will help you and us if you read the business magazines most closely related to your job responsibility. Attached is a list of the publications we believe will interest you, together with their subscription prices. We will pay half the cost of any publication you select." There was a place for the employee's home address.

The company has followed this policy for many years. Most of its key men get the publications they want at *home* where reading is less hurried and more of it sinks in. Result: They have one of the best-informed group of engineers in the business. Little gets by. This company's growth record is unmatched in its field. And most of the growth has come from within—in terms of new products.

Isn't it time you took a long look at your own company's policies?—AH

INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate but PRODUCT ENGINEERING assumes no responsibility for errors or omissions.

Allied Research Products, Inc. 48
American Felt Co. 43
Arwood Precision Casting Corp. 51
Automatic Steam Products Corp. 50

Beaver Precision Products, Inc. 22
Bethlehem Steel Co. ..... 3rd Cover

Chain Belt Co. 25-28
Chicago Rawhide Mfg. Co. ..... 4th Cover

Delco Products Div., General Motors Corp. 14
du Pont de Nemours & Co. (Inc.), E. I. 31

Faber-Castell Pencil Co., Inc., A. W. 45

Garlock Packing Co. 3
Goodyear Tire & Rubber Co. 9

Haynes Stellite Co., Div., Union Carbide Corp. 23
Hommel Co., O. 46

Indium Corp. of America 44
International Nickel Co., Inc. 16

McGraw-Hill Book Co., Inc. 52
Mirro Aluminum Co. 12-13
Moraine Products, Div., General Motors Corp. ..... 2nd Cover

National Vulcanized Fibre Co. 18
Newark Wire Cloth Co. 42

O'Neil-Irwin Mfg. Co. 30

Packard Electric Div., General Motors Corp. 47
Phillips Chemical Co., Plastic Sales Div. 35

Sealube Co. 44
Sigmamotor, Inc. 50
South Chester Corp., Southco Div. 34

Torngren Co., Inc., C. W. 46

Viking Pump Co. 46

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74 for Your Information (personal)

Dial Works Silent Caddy

There seems no end to new products for taking the work out of play. Now comes this mechanized caddy that brings up the golf club you want—just by dialing its number. The club handles are clipped to an axial tube inside a cylindrical container; their heads rest in two rubber bowls, one for irons, the other for woods. When you turn the dial lever, the tube revolves and the desired club appears in the lengthwise opening atop the container. Kaiser Aluminum, which features Dial-A-Club in one of its displays, happily points out using aluminum for the container makes the device lighter in weight than a conventional golf bag. The detachable chassis is steel, though, and boasts dustproof bearings. Over-all length of unit is 46 in. Manufacturer is Dial-A-Club, 11681 Foothill Blvd., San Fernando, Calif. Price: $49.50.

The Well-dressed Phone

If your telephone is just standing around by itself, you're wasting space. Besides a music box auxiliary that will keep the other person happy while you answer the doorbell or look up needed data (FYI, Oct. 7) there are now a one-cigaret ash tray to dangle from the telephone post, a phone index that can be hung on the back, and a memo-pad holder that will slip underneath. How about your own products? Are there accessories that could add to user convenience, and increase your company's sales?

You *can* take it with you

Precision and portability are combined in this new plastic drawing board made of translucent high-impact polystyrene. It's 10 by 12 in., comes equipped with two transparent plastic triangles and two retractable metal straight-edges, yet weighs less than ½ lb. The underside has spring clips to hold the triangles, and rubber cushions to protect desk or table. It's available from Leslie Creations, Dept. 8716, Lafayette Hill, Penna., for $4.95 plus 50¢ handling charge.

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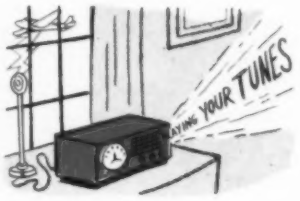


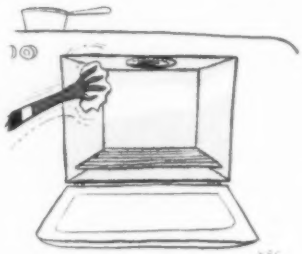
. . . a device to automatically raise radio volume as ambient noise level increases? A leading auto-radio manufacturer has already developed a device to increase radio volume as a function of speed—to compensate for wind and tire noises—but this only starts to solve the problem. A noise-sensitive controller would be a boon to people living near airports, railroads or heavily traveled highways where noise level fluctuates greatly.

—T. N. Tyler

. . . an automatic coffee pot for only 2 or 3 cups instead of 6 or 10—but with a big enough opening so that a man can get his hand in to clean it out after use. And please replace the nuts projecting into the container with some other means of attaching the handle. They only skin a man's knuckles.

. . . provide some method of easing the chore of folding blueprints? It is uneconomical to attach a regular folding machine because of its limited use and the variety of drawing sizes to be handled. However, normal cut sizes (A, B, C, D and E) of printing paper could be supplied with a slight crease so that hand folding is expedited and improved in uniformity and quality. Roll size paper might be creased every 11½ in. transverse to the roll to produce accordion style folds. The creases must be designed not to show up as lines during the printing process and so that piles of cut paper lie flat for easy packaging.

—H. Belofsky



. . . a silicone compound to coat the insides of ovens so they can be cleaned with a wipe of a cloth? The cleaning compounds now available do a poor job of removing hardened grease or food; they are poisonous, toxic, difficult to use and expensive. Some silicone release agents used in baking and molding come close to having the required qualifications.

—T. N. Tyler

Have you a pet project but neither the time nor inclination to do the necessary R & D? Product Engineering will welcome (and pay $10 each for) similar ideas based on known scientific principles but lacking an inspired manufacturer

How's your fastener I.Q.?

See if you can guess the names of the special fasteners shown below! Each special can be identified by simply turning this page upside down. No fair peeking. A score of six correct answers, or better, establishes you as an authority on fasteners. Anything lower than that calls for more study.

These specials were selected at random from among the hundreds of types of unusual headed and threaded items turned out recently by our Lebanon, Pa., plant. Each meets a specific fastener need. If you feel that a specially designed bolt might perhaps do a better job than the standard ones you are now using, feel free to talk it over with us. We'll be pleased to advise you, whether the answer is yes or no. Simply get in touch with Bethlehem's nearest sales office.

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STANDARD END FACE SEALS For sealing problems outside the capabilities of shaft-type seals, C/R End Face Seals are recommended. They require minimum face contact pressure, create minimum friction, and give unsurpassed performance under the most severe conditions. Available in two series — long and short — from ¾" to 4" shaft diameter suitable for internal and external pressures to 500 p.s.i., temperatures to 500° F., and peripheral speeds to 15,000 F.P.M. Typical applications: sealing track rollers of crawler tractors; sealing high-speed accessory drives, and medium speed gear cases in washing machines, dishwashers. Write for Bulletin EF-100.

SIRVENE SYNTHETIC RUBBER PRODUCTS The advanced level of compounding and molding elastomers achieved by C/R Sirvene Engineers is widely known. They will design, compound and produce a part to your exact specifications of hardness, elasticity, and resistance to aging, temperature, oils or chemicals — with consistent uniformity and quality. A typical list of products includes oil seal packings, diaphragms, cups, boots, gaskets — to name but a few.

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